

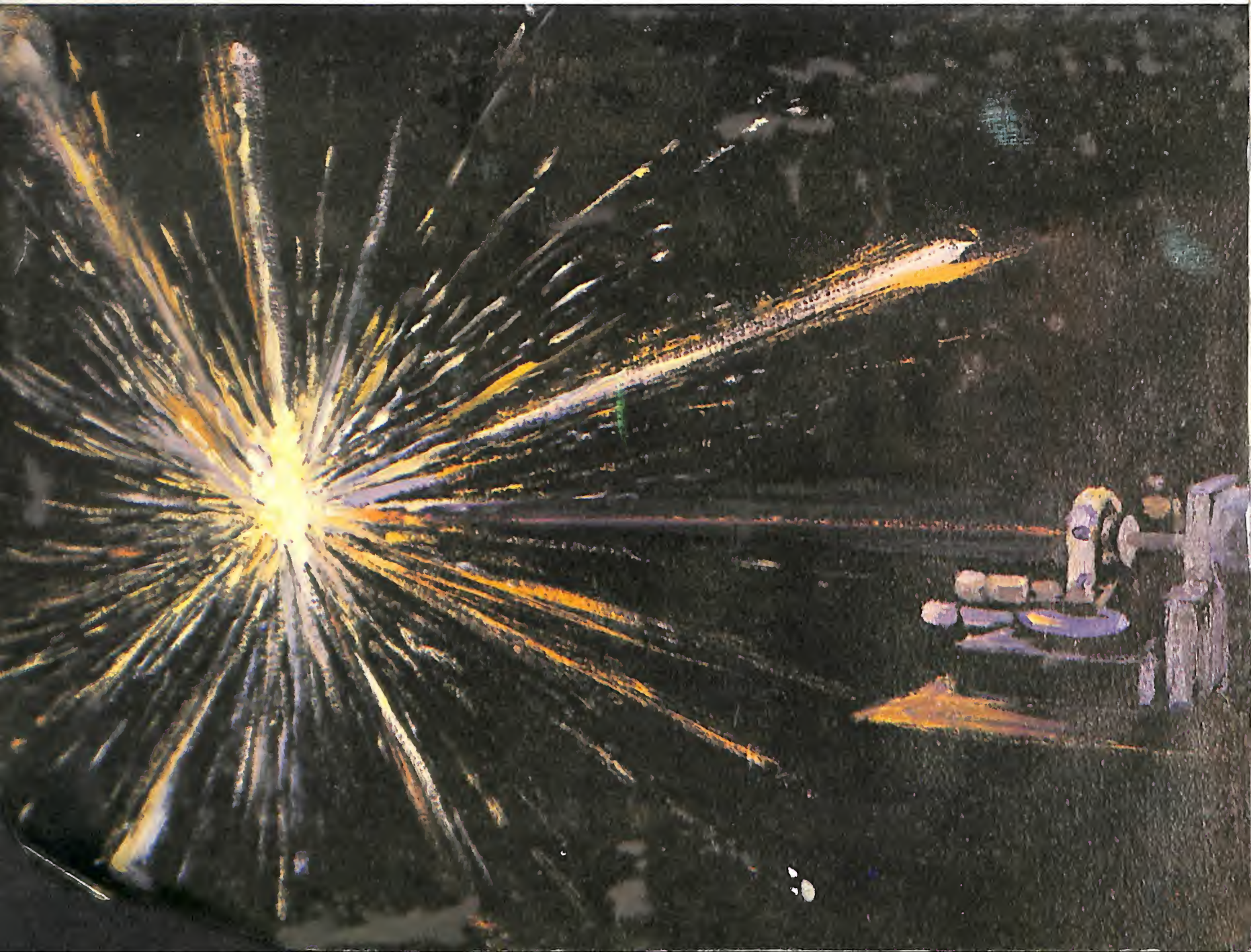


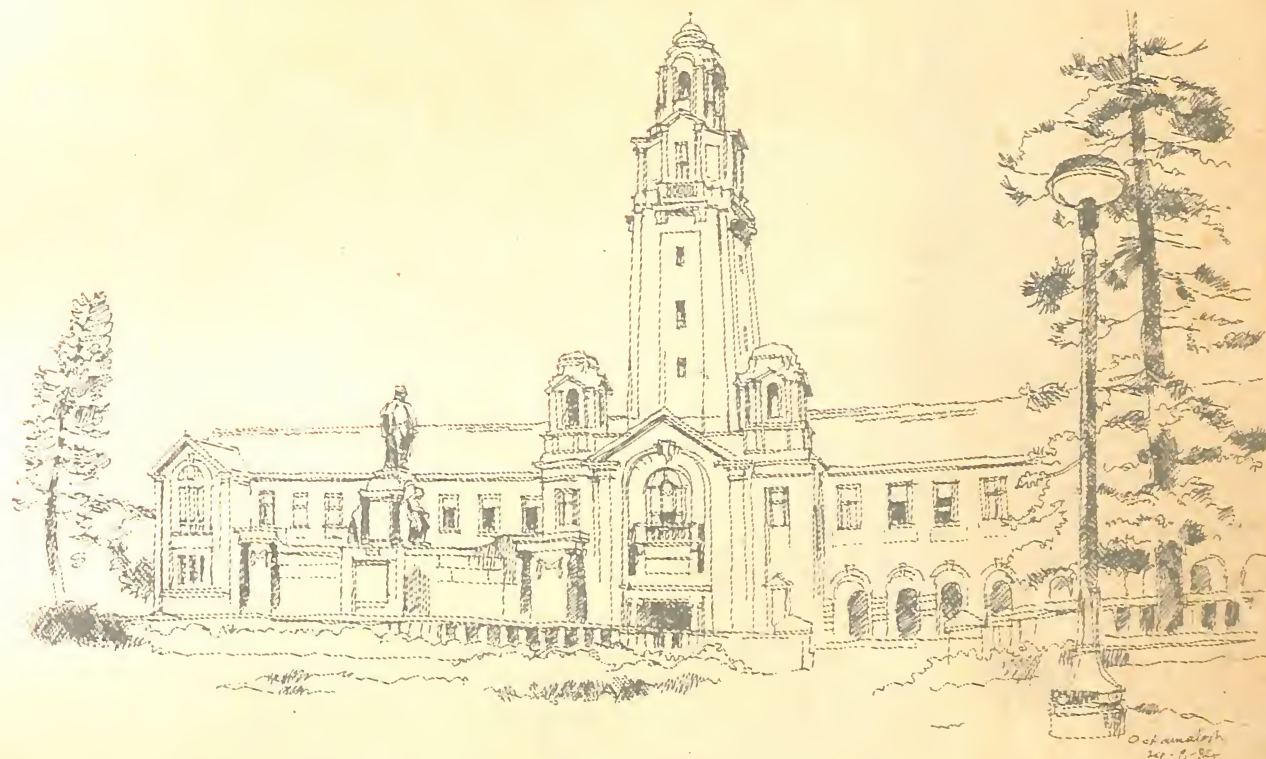
INDIAN INSTITUTE OF SCIENCE

1909-84

PLATINUM JUBILEE







The Indian Institute of Science

Platinum Jubilee
1909—1984

R. 25

12-12-1984

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Foreign Languages Section,
Indian Institute of Science,
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*Where tireless striving stretches its arms
towards perfection.*

— RABINDRANATH TAGORE.



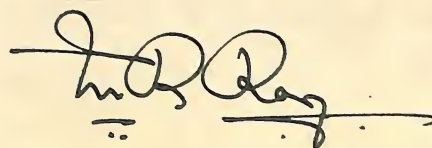



The founding fathers dreamed of an institute devoted to advanced research and education in science and technology when there was little or no science in the country. Seventy five years have passed since then. The Institute has grown in size and stature beyond expectations. The Institute, which started with less than a handful of departments, a small faculty and hardly 20 students, today has more than 30 departments and centres, 350 members in the faculty and 1300 students and research scholars. Over the years, the Institute has contributed much to research and development and has earned the reputation of being a centre of excellence. It has been constantly reviewing its goals and objectives taking up newer challenges and exploring newer horizons. It has also been the academic birthplace of many a person of genius.

*This is the time to express our gratitude to
that great visionary, J. N. Tata,
Krishnaraja Wodeyar IV and Seshadri Iyer,
Dorabji Tata and Ratan Tata
and the many eminent men who have contributed
in several ways to the Institute.*

*When I was a boy, I was enchanted by this beautiful,
verdant campus where men studied in harmony with Nature.
We have to strive and maintain that harmony.*

*The saga of this unique institute has been impressive. We
have to make the flame of IISc eternal.*



Director

Visitor

The President of India

President of the Court

J R D Tata

Chairman of the Council

G K Chandiramani

Director

C N R Rao

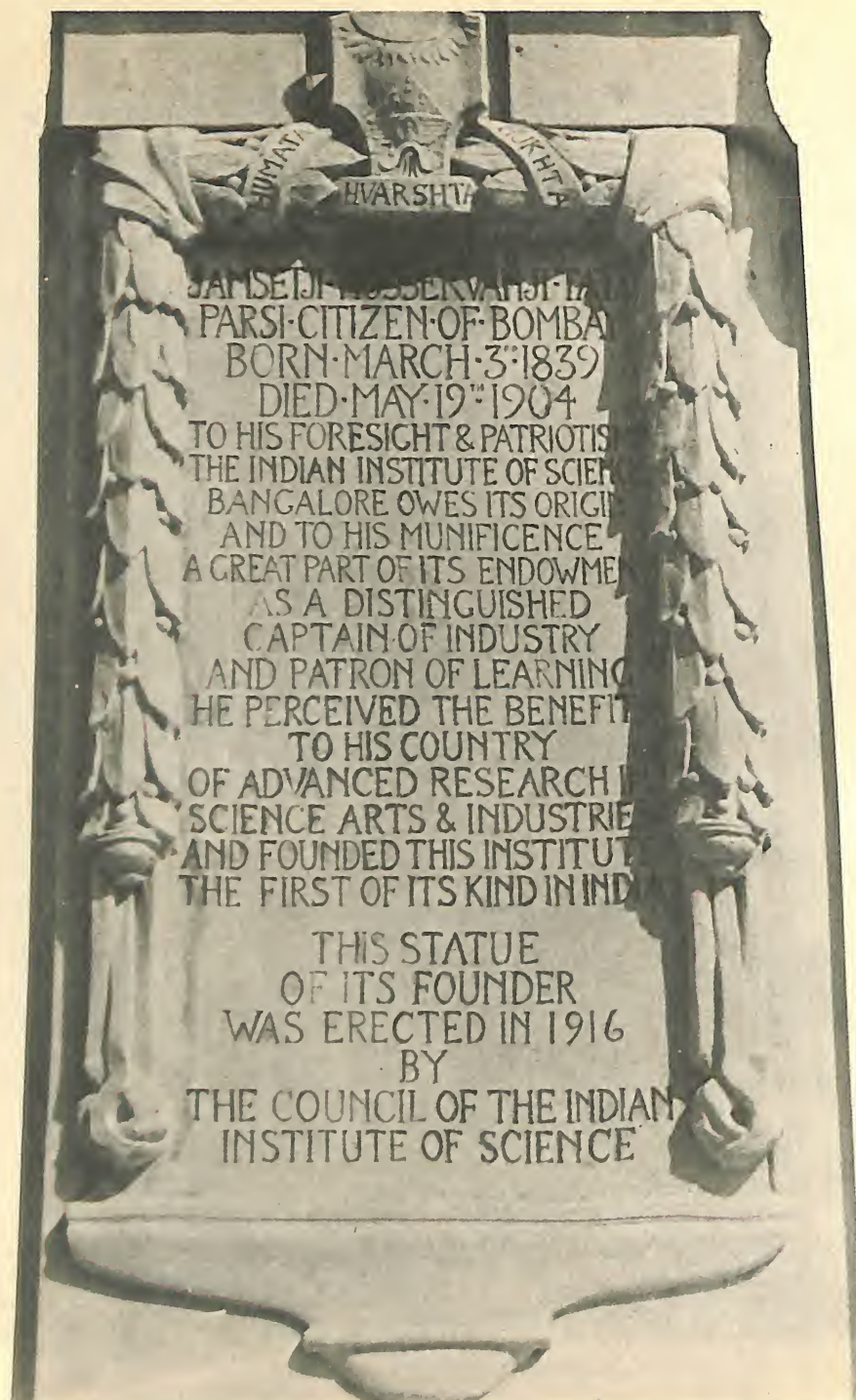
Registrar

T Nanjunda Rao





Jamsetji Nusserwanji Tata



JAMSETJI NUSSEERWANJI TATA
PARSI CITIZEN OF BOMBAY
BORN MARCH 3 1839
DIED MAY 19 1904

TO HIS FORESIGHT & PATRIOTISM
THE INDIAN INSTITUTE OF SCIENCE
BANGALORE OWES ITS ORIGIN
AND TO HIS MUNIFICENCE
A GREAT PART OF ITS ENDOWMENT
AS A DISTINGUISHED
CAPTAIN OF INDUSTRY
AND PATRON OF LEARNING
HE PERCEIVED THE BENEFIT
TO HIS COUNTRY
OF ADVANCED RESEARCH IN
SCIENCE ARTS & INDUSTRIES
AND FOUNDED THIS INSTITUTE
THE FIRST OF ITS KIND IN INDIA

THIS STATUE
OF ITS FOUNDER
WAS ERECTED IN 1916
BY
THE COUNCIL OF THE INDIAN
INSTITUTE OF SCIENCE

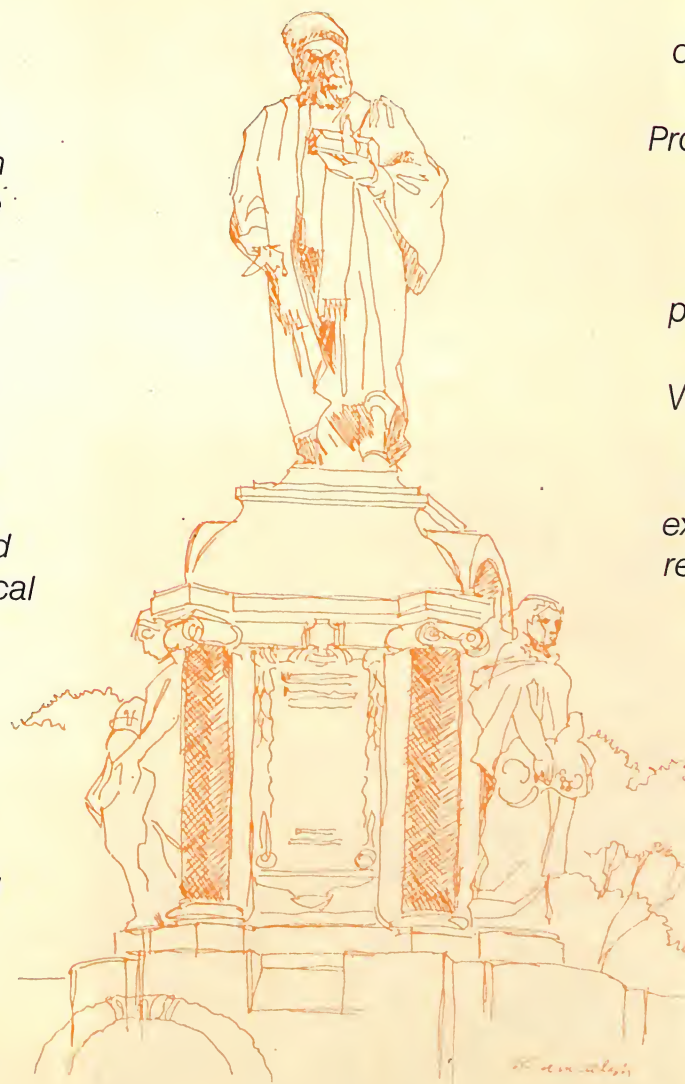
THE INDIAN INSTITUTE OF SCIENCE

A Historical Perspective

JAMSETJI NUSSERWANJI TATA (1839-1904) was one of the extraordinary men who even towards the end of the nineteenth century was convinced that the future progress of this country depended crucially on research in Science and Engineering. He created an endowment in September 1898 to establish a University of Science for educating and developing the faculties of the best of our young men. It is interesting to recall that the original plan of Jamsetji included scientific and technological education, medical and sanitary education including research in bacteriology, studies in philosophy and education (including methods of education), ethics and psychology, Indian history and archaeology, statistics and economics and comparative philology. He envisaged this university as destined to

Platinum Jubilee

promote original investigations in all branches of learning and to utilise them for the benefit of India.



However, his contemporaries appear to have had difficulty in comprehending fully the plan of Jamsetji and, therefore, after consulting several authorities in our country, he constituted a Provisional Committee to prepare the required scheme for the setting up of the Institute. On 31st December 1898, a draft prepared by the Committee was presented to Lord Curzon, the Viceroy-Designate. The Secretary of State for India requested the Royal Society of England for an expert view, and the Royal Society requested William Ramsay, Nobel Laureate and discoverer of the noble gases, to help. He made a quick tour of the country and reported that Bangalore was a suitable place for such an institution. In order to finalise the scheme Lord Curzon took the advice of Orme Masson of the University of Melbourne and Lt Col Clibborn of the College



King George V

Dorabji Tata



Lord Curzon

Ratan Tata



of Engineering, Roorkee. The Clibborn—Masson Committee recommended Roorkee as a suitable area. However, on the initiative of the Dewan Sir K Seshadri Iyer, the Government of His Highness Shri Krishnaraja Wodeyar IV, the Maharaja of Mysore came forward with an offer of 372 acres of land, free of cost, in Bangalore and promised other necessary facilities. Thus the original scheme of Jamsetji Tata became a tripartite venture with the association of the Government of India and the Government of the Maharaja of Mysore.

The detailed report that emerged recommended that 'the Institute be devoted to experimental science and that it aim at training students in experimental methods, carrying out original research and discharging the functions of an accepted authority and referee on all scientific problems arising within its own domain'.

The Provisional Committee had only limited powers. However, when the constitution was approved by the Viceroy Lord



Krishnaraja Wodeyar



K Seshadri Iyer



Minto as Patron, the necessary Vesting Order was signed on 27th May 1909. The Council shortly afterwards came into existence. After independence the President of India became the "Visitor". The Council continues to be the principal authority governing the Institute. It is assisted in the formulation of the academic policies of the Institute by the "Court". The Director is the executive authority and in the management of the Institute he is assisted by the "Senate" and the Science and Engineering Faculties.

Early in 1911, the Maharaja of Mysore laid the foundation stone of the Institute and on 24th July the first batch of students were admitted to the Department of General and Applied Chemistry under Norman Rudolf and the Electro-Technology under Alfred Hay. Within two months the Department of Organic Chemistry was opened. The buildings, students quarters and bungalows distributed over a large area provided a pleasant place to work. The architecture of the main building which today houses the administration and

THE COURT

Tata JRD President

Ambasankaran C Director, Electronics & Instrumentation Group, Bhabha Atomic Research Centre, Bombay

Bhabha JJ Director, Tata Sons Ltd., Bombay (Nom. Council)

Choudhury JM Vice-Chancellor, Gauhati University, Gauhati (Rep. Indian Universities)

Gautam Mathur Director, Institute of Applied Manpower Research, New Delhi

Gurbaksh Singh Vice-Chancellor, Delhi University

Hari Narain Director, National Geophysical Research Institute, Hyderabad (Rep. Council of Scientific & Industrial Research)

Jain NL Director, Technical Education, Govt. of Madhya Pradesh

Krishna Murthy MV Fedn. of Ind. Chambers of Commerce & Industry

Parekh BC Vice-Chancellor, M.S. University of Baroda, Baroda (Rep. Indian Universities)

Ramesh Mohan Director, Central Institute of English and Foreign Languages, Hyderabad (Rep. Indian Universities)

Ramalingaswamy V Director General, Indian Council of Medical Research, New Delhi (Nom Council)

Sanat Biswas Bengal Engineering College, Howrah

Sundaresan BB National Environmental Engg. Research Institute, Nagpur

Smt. Selvie Das P Director, Collegiate Education, Govt. of Karnataka

Somaiya SK Godavari Sugar Mills Ltd., Bombay

Seth DS Deputy Chairman & Managing Director, Tata Chemicals Ltd., Bombay

Sivaraja Iyer SR Head, Dept. of Chemistry, University Dept. of Chemical Technology, Bombay

Tata MK Bombay

Varadarajan S Secretary, Dept. of Science and Technology, Govt. of India

Vaiyapuri S Director, Technical Education, Govt. of Tamil Nadu.

Members of the Council and Professors.

THE COUNCIL

Chandiramani GK *Chairman*

Asvathanarayana G *Secretary, Education Department, Government of Karnataka*

Balasubramanian V *Secretary, Department of Science & Technology, Government of Karnataka*

Choudhury JM *Vice-Chancellor, Gauhati University*

Dinshah K Malegamvala *Director, Sir Dorabji Tata Trust, Bombay*

Hanumanthappa H *Member of Parliament*

Indrajit Gupta *Member of Parliament*

Luthra SP *Chairman, Northern Regional Committee, (Representative of All India Council for Technical Education)*

Madhuri R Shah (Mrs) *Chairman U G C*

Man Mohan Singh *Financial Adviser, Ministry of Education and Culture, Government of India*

Menon MGK *Vice-Chairman, Planning Commission, Government of India*

Parthasarathy P *Member of Parliament*

Parekh BC *Vice-Chancellor, M.S. University of Baroda*

Ramanna R *Chairman, Atomic Energy Commission*

Ramaiah M *Director, Structural Engineering, Research Centre, Madras*

Ramasarma T *Dean, Science Faculty*

Rao CNR *Director*

Srinivasan MS *Jt. Educational Adviser (T), Ministry of Education & Culture, Government of India*

Siva Reddy A *Dean, Engineering Faculty*

Varadarajan S *Director General, Council of Scientific & Industrial Research*

Nanjunda Rao T *Registrar (Secretary).*

FORMER MEMBERS OF THE COURT

Atma Ram
Birbal Sahani
Bhabha JH
Bhabha HJ
Bramh Prakash
Choksi JD
Guha PC
Ghatge VM
Giri KV
Krishnan KS
Krishnaswamy KR
Lakshmanaswamy Mudaliar A
Malcolm S Adiseshaiah
Mirza Ismail
Nag Choudhury BD
Nayudamma Y
Rajagopala Chari SP
Ramaswami Mudaliar A
Rao VKRV
Shyam Prasad Mukherjee
Subba Rao NS
Saha MN
Subramanyam V
Srinivasan K
Sanjeeva Rao B
Sidhu GS
Santappa M
Valluri SR
Venkateshachar B
Vikram Sarabhai

FORMER CHAIRMEN OF THE COUNCIL

SM Fraser
H Daly
HJ Bhabha
WP Barton
Col. SG Knoy
CC Watson
SE Pears
Col. RJC Burke
JD Chandy
CWC Cotton
LGL Evans
Col. Gordon
Co. D.de. MS Fraser
Col. P Gaisford
Walter Campbell
Vithal N Chandavarkar
R Choksi

MEMBERS OF COURT

Professors

Adiga PR	Krishna G	Prabhakara Rao K	Sathyanaarayana S
Aggarwal Vijay	Krishna Murthy AV	Prabhashanker V	Satyam M
Anand GV	Krishna Murthy EV	Prabhu A	Sen Gupta DP
Anantha Iyer GV	Krishna Murthy S	Prasad CR	Seshadri MR
Anantha Ramu S	Krishna Murthy SS	Prasad UR	Seshan S
Anil Kumar	Krishna Rao GS	Prasad YVRK	Sharat Chandra H
Appaji Rao N	Krishnan V	Priti Shankar (Mrs)	Shrivastava SK
Arakeri Vijay H	Krishnan V	Raghavan MR	Singh Surinderjit
Badrinarayanan MA	Kubair VG	Raja Gopal ES	Sinha KP
Balaram P	Kumar A	Rajaraman R	Siva Reddy A
Balasubrahmanyam SN	Kumar N	Rajaraman V	Somasekhara N
Biswas NN	Kumar R	Raju TA	Sonde BS
Chakrabarti A	Lahiri AK	Rama Prasad	Soundararajan S
Chanchal Uberoi (Mrs)	Lakshmana Rao NS	Ramakrishna Iyengar BS	Soundranayagam S
Chandra AK	Madhyastha KM	Ramakrishna J	Sreenivasamurthy KS
Chandrashekhara K	Mahadevan S	Ramakrishna K	Sridharan A
Cherayil JD	Mallya RM	Ramakrishna Kurup CK	Srinath LS
Chidambara MR	Manas Chanda	Ramakrishna Rao M	Srinivasan Malur N
Clairon G (Miss)	Manohar H	Ramakrishna S	Srinivasan Mandayam N
Damania RB	Mohan Rao M	Ramakrishnan C	Subba Rao BK
Dattaguru B	Moudgal NR	Ramamurthy V	Subba Rao GSR
Desayi Prakash	Mukunda HS	Raman KS	Subba Rao KS
Deshpande PK	Mukunda N	Ramananda Rao G	Subba Rao PV
Deshpande SM	Munjial ML	Ramasarma T	Subramanian DK
Durvasula S	Murthy ISN	Ramesh Maheshwari	Subramanyam SV
Dwarakadasa ES	Murthy MS	Ranganatham BV	Sudarshan ECG
Easwaran KRK	Nagaraj TS	Ranganathan S	Suryanarayanan G
Gadgil Madhav	Nageswara Rao S	Rangarajan SK	Thathachar MAL
Gadgil Sulochana (Mrs)	Naidu MS	Rangaswamy SV	Tikekar VG
Ganguly T	Naidu PS	Rao AK	Tirunarayanan MA
Ganeshsundaram PC	Narasimha R	Rao KJ	Vaidyanathan CS
Gaonkar, GH	Narasimhan MV	Rao NJ	Vasu KI
Gopalakrishnan J	Narayana Iyengar R	Rao VSR	Vasudeva Murthy AR
Gopinathan KP	Narayanan PS	Rathna Devanathan (Mrs)	Vedula S
Govinda Raju SP	Narayanawamy K	Rau RSN	Venkataramana Rao GN
Govinda Rao VMH	Narsimhan G	Ravindram M	Venkatesan K
Gururaj BI	Natarajan KA	Reddy AKN	Venkatesh YV
Iyengar GNK	Nath Girishwar	Reddy NM	Vijaya Kumar K
Iyengar KTS	Nema RS	Renuka Ravindran (Mrs)	Vijayan M
Jacob KT	Padayatty JD	Sachdev PL	Viswamitra MA
Jacob TM	Padmanaban G	Sankar Rao M	Viswanadham N
Jagadish KS	Pai Verneker VR	Sarma IG	Vithayathil PJ
Jain SR	Pappu SV	Sarma KVN	
Jain VK	Parthasarathy K	Sarma VVS	
Kasturi TR	Pasupathy J	Sasisekharan V	Iyengar TKS
Keshava Murthy K	Patnaik LM	Sastry DH	Librarian
Khincha HP	Phoolan Prasad	Sastry PS	Nanjunda Rao T
Kishore K	Podder SK	Sathyanaarayana DN	Registrar (Secretary)
Krishan Som			

the Faculty Hall, is in classical style, carried out in grey granite and is crowned by a handsome tower which has become one of the landmarks of Bangalore. In front of it stands a noble monument, the work of Gilbert Bayes... One relief contains the figure of Jove with his thunderbolts to typify electricity and Vulcan with his anvil ready for steel; in the other Minerva holds a distaff covered with flax and Calliope represents research. A bronze rail has as its centre a lamp of learning, flanked by dolphins to symbolize the founder's travels. Abundance on one side and Knowledge at the other support the centre shaft. At its feet is an inscription which will serve to remind future generations of the generosity of Jamsetji Tata and the persistence with which he worked for the welfare of India.

With the establishment of the University Grants Commission by the Government of India in 1956, the Institute came under its purview and is one of the thirteen deemed universities.

During the past 75 years many

IISc 1909-1984



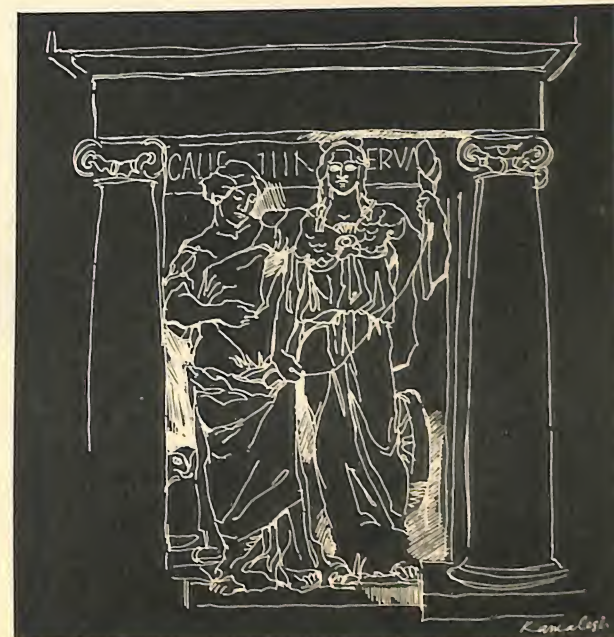
are the alumni and faculty who have gone out from this Institute to direct science and technology in the country, to create and nurture other laboratories and scientific institutions and to

found key Industries. CV Raman, HJ Bhabha, Vikarm Sarabhai, JC Ghosh, MS Thacker, S Bhagavantam, S Dhawan and scores of others who have played a key role in the scientific and technological progress of our country have been closely associated with the Institute. In fact, it is one of the Institutes which can today boast of having a very large number of Bhatnagar awardees, fellows of the science academies and recipients of other distinguished national and international recognitions.

The Institute has been able to make many significant contributions primarily because of a certain uniqueness in its character. It is neither a national laboratory which concentrates solely on research and applied work to the exclusion of teaching nor a conventional university which concerns itself mainly with teaching. The Indian Institute of Science is concerned with research in frontier areas and education in current technologically important areas. On account of its being a



relatively small institution it is able to innovate and introduce newer systems of imparting knowledge and educational reforms such as offering courses under a unit system and also





M. Visvesvaraya



C. V. Raman

I think that dreams are the best part of life. It is not the realisation, but the anticipation that I am going to make a discovery tomorrow that makes a man of science work, whether he makes the discovery or not... The greatest thing in life is not the achievement but the desire to achieve... It is the striving that is worthwhile.

— C V Raman



Homi J Bhabha

The only Reader of Theoretical Physics at the Institute went on to create Tata Institute of Fundamental Research and the Atomic Energy Commission and initiated Electronics and Space Programmes in our country.



Vikram A Sarabhai

Conducted cosmic ray research at the Institute. Laid the foundation of the Indian Space Programme.

FELLOWSHIPS

Members of the faculty have won distinctions and awards, both national and international, in recognition of their research and developmental work. Fellows of Indian Academy of Science, Indian National Science Academy and the Royal Society, and winners of Bhatnagar award in the Institute are given.

THE INDIAN ACADEMY OF SCIENCES

&

THE INDIAN NATIONAL SCIENCE ACADEMY

Abraham KP
Adiga PR
Appaji Rao N
Balaram P
Bhatt MV
Bhattacharyya PK
Gadgil M
Jacob TM
Kasturi TR
Krishnan RS
Kumar R

Moudgal NR
Mukunda N
Narasimha R
Padmanaban G
Rajagopal ES
Rajaraman R
Rajaraman V
Ramachandran GN
Ramakrishnan T
Ramakrishnan TV
Ramaseshan S

Ranganathan S
Rangarajan SK
Rao CNR
Rao VSR
Sasisekharan V
Sinha KP
Sudarshan ECG
Vaidyanathan CS
Viswamitra MA

THE INDIAN ACADEMY OF SCIENCES

Deshpande SM
Krishnamurthy EV
Krishnan V
Kumar N
Mukunda HS

Narayanan PS
Nath G
Rao KJ
Reddy AKN
Sachdev PL

Sarma IG
Sharat Chandra H
Srinath LS
Venkatesan K
Vijayan M

THE INDIAN NATIONAL SCIENCE ACADEMY

Ganguly J

Khetrpal CL

Sastry PS

THE ROYAL SOCIETY (FRS) LONDON

Ramachandran GN

Rao CNR

JAWAHARLAL NEHRU FELLOWSHIP

Ramachandran GN 1968
Rao CNR 1973

Srinath LS 1975
Ramaseshan S 1977

trying out methods of evaluation and assessment which are highly reliable. For example, this is one of the few institutes which have introduced a four-year integrated M.E. Programme based on the Nayudamma Committee Report on reforms in postgraduate engineering education in the country; at the same time the Institute retains a few Bachelor of Engineering programmes for graduates in science who wish to turn to an engineering career after acquiring a Bachelor's degree in science.

The Institute has pioneered many fields of activity like Aerospace, Communications, Electronics, Electrical, Metallurgical and Chemical Engineering, Automation, Bio-Chemistry and Bio-Physics, Material Science and Solid State and Structural Chemistry and has acted as a reservoir from which the leadership and the manpower for the future scientific developments and industries can be drawn. Work has been taken up in several new emerging areas of importance, such as space science and technology

SHANTI SWARUP BHATNAGAR PRIZE

Ramachandran GN	1961	Physical Sciences
Ganguly J	1963	Biological Sciences
Ramaseshan S	1966	Physical Sciences
Rao CNR	1968	Chemical Sciences
Sinha KP	1974	Physical Sciences
Narasimha R	1974	Engineering Sciences
Kumar R	1976	Engineering Sciences
Rajaraman V	1976	Engineering Sciences
Moudgal NR	1976	Medical Sciences
Raja Gopal ES	1978	Physical Sciences
Sasisekharan V	1978	Biological Sciences
Krishnamurthy EV	1978	Mathematical Sciences
Mukunda N	1980	Physical Sciences
Adiga PR	1980	Medical Sciences
Subba Rao GSR	1982	Chemical Sciences
Podder SK	1982	Biological Sciences
Ramakrishnan TV	1982	Physical Sciences
Khetrapal CL	1982	Chemical Sciences
Padmanaban G	1983	Biological Sciences
Rajaraman R	1983	Physical Sciences
Phoolan Prasad	1983	Mathematical Sciences

HARI OM TRUST AWARD OF THE UNIVERSITY GRANTS COMMISSION

Ramachandran GN	1974	J.C. Bose Award—(Life Sciences)
Rao CNR	1975	C.V. Raman Award—(Physical Sciences)
Vaidyanathan CS	1976	J.C. Bose Award—(Life Sciences)
Narasimha R	1976	H.J. Bhabha Award—(Applied Sciences)
Moudgal NR	1977	J.C. Bose Award—(Life Sciences)
Sarma IG	1977	Vikram Sarabhai Award—(Systems Science)
Rao VSR	1980	J.C. Bose Award—(Life Sciences)
Sasisekharan V	1981	J.C. Bose Award—(Life Sciences)

FEDERATION OF INDIAN CHAMBER OF COMMERCE & INDUSTRIES AWARD FOR RESEARCH

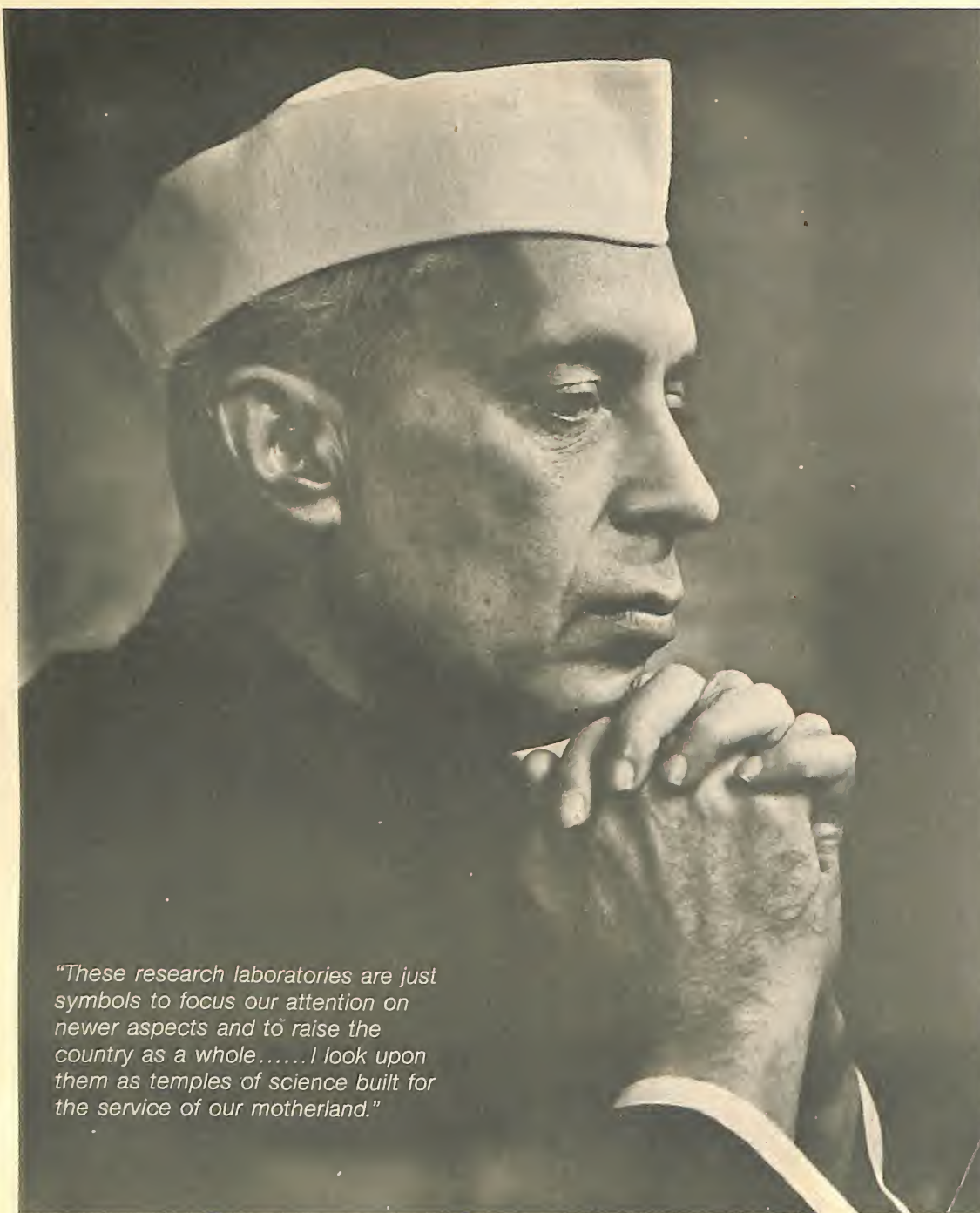
Rao CNR	1977
Ganguly J	1978
Sasisekharan V	1980

VASVIK RESEARCH AWARD

Ramaseshan S	1978
Rao GNV	1979
Krishnaswamy TN	1979
Durvasula S	1979
Reddy KR	1979

HONORARY FELLOWS Indian Institute of Science

Alfred Hay	1922
Sudborough JJ	1925
Catterson-Smith JK	1930
Bhabha HJ	1932
Forster MO	1933
Watson HE	1938
Vithal N Chandavarkar	1957
Jawaharlal Nehru	1959
Visvesvaraya M	1959
Raman CV	1959
Tata JRD	1968
Mudaliar AL	1968
Vikram A Sarabhai	1968
Kothari DS	1968
Choksi R	1972
Chandiramani GK	1981
Dhawan S	1981
(Smt) Indira Gandhi	1984
Menon MGK	1984
Ramachandran GN	1984
Bhagavantam S	1984
Ramachandran A	1984



"These research laboratories are just symbols to focus our attention on newer aspects and to raise the country as a whole.....I look upon them as temples of science built for the service of our motherland."

Pandit Jawaharlal Nehru

(including astronomy and astrophysics), environmental science (including theoretical, meteorological and monsoon dynamics), life sciences (including genetic engineering), developmental studies in rural technology and energy problems.

The Council of the Institute confers Honorary Fellowship on eminent scholars and scientists and on those who have made noteworthy and lasting contributions to the cause of Science and Industry in India. Among the 22 recipients of this distinction are Pandit Jawaharlal Nehru, M Visvesvaraya, CV Raman, JRD Tata, Vikram A Sarabhai and Indira Gandhi.

Besides formal education and research, the Institute has been playing an active part in offering, through the Continuing Education Centre, short-term educational and training programmes to scientists and technologists in service. The Continuing Education Programme covers a wide range of topics, and since these programmes are particularly organised with the assistance of the professional

President of the Court



J R D Tata

societies, the courses are popular. Approximately 1000 students go through these programmes every year.

In keeping with its aims and objects the Institute has organised a Centre for Scientific and Industrial Consultancy (CSIC) and through this a significant amount of R&D work has been done on identified projects sponsored by industries. The knowhow generated in the Institute in certain specific areas has been transferred to industries. To mention one, the work on silicon-based chemicals initiated at this Institute has fructified into a major collaborative programme with the Mettur Chemicals and Industrial Corporation.

In a similar way, the facilities available at the Institute (like the wind tunnels—low and high speed, water tunnel, the major computational facilities and high voltage and high current generators etc.) have been helping both public and private sector industries and the Defence.

There has also been a certain



G K Chandiramani

R Choksi



Vithal N Chandavarkar





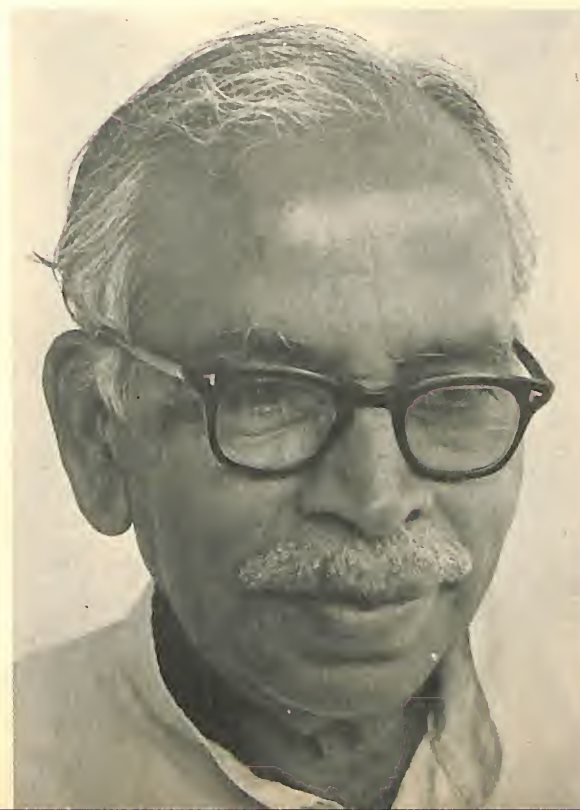
Ardeshir Dalal

A L Mudaliar



John Mathai

D S Kothari



amount of social utilisation of work in biosciences, like the plant tissue culture of sandal wood, eucalyptus and teak wood, disease control in silk worms, and nutritional value enhancement of rice strains. Some technologically important development work that has been done recently concern the technology of cryogenic containers, studies of fluid flows in relation to cooling water sumps and cooling tower blades and design of large water tunnel and microhydroelectric power plants.

In all these endeavours the Institute strives to contribute to the scientific, academic and technological goals of our country with a keen awareness of its noble tradition and the need for maintaining a high quality in all its activities.

Grateful acknowledgement is made to the following sources :

1. *Jamsetji Nusserwanji Tata—A Chronicle of his life* by Frank Harris Blackie and Sons, Second Edition, 1958.
2. *The Creation of Wealth* by RM Lala, Published by PC Manaktala for IBH Publishing Co. 1981.



FORMER DIRECTORS OF THE INSTITUTE



Morris W Travers

1909-1914



A G Bourne

1915-1921

C V Raman

1933-1937



Sketch by Homi J Bhabha

J C Ghosh

1939-1948

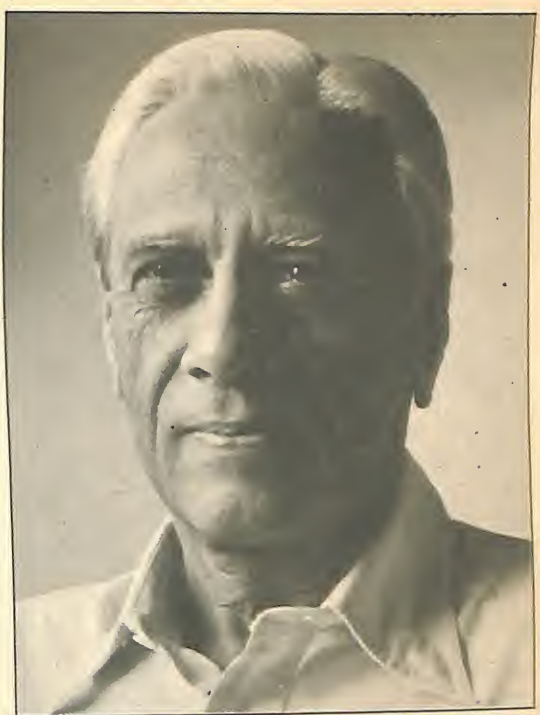




M O Forster 1922-1933



S Bhagavantam 1957-1962



S Dhawan 1962-1981

M S Thacker 1949-1955



D K Banerjee 1971-1972



S Ramaseshan 1981-1984





C N R Rao
Director

A Campus Vignette



Tāla Marg



CHAIRMEN OF DIVISIONS

PS NARAYANAN

TR KASTURI

G. KRISHNA

S SOUNDARANAYAGAM

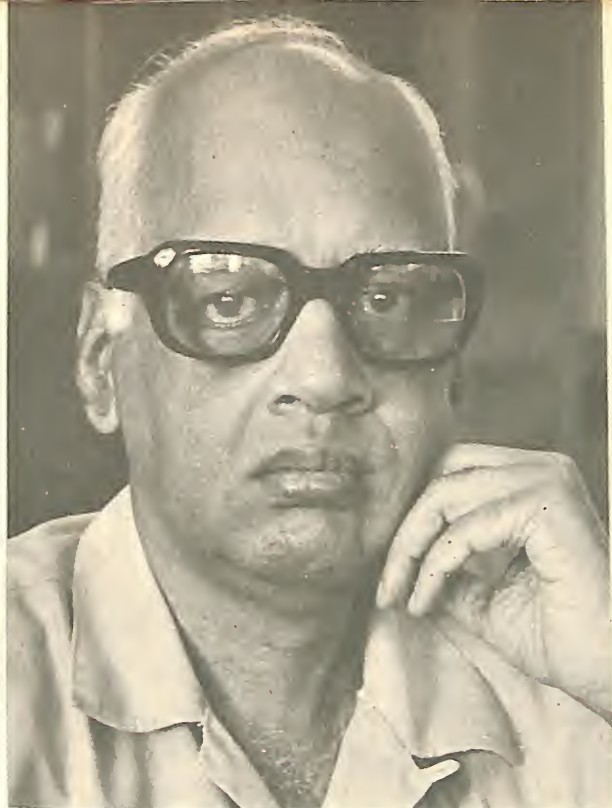
DEANS

T RAMASARMA

A SIVA REDDY



Smt. Indira Gandhi



G N Ramachandran

INSA Einstein Professor of mathematical philosophy at the Institute. The first student of the Institute to become a Fellow of the Royal Society.



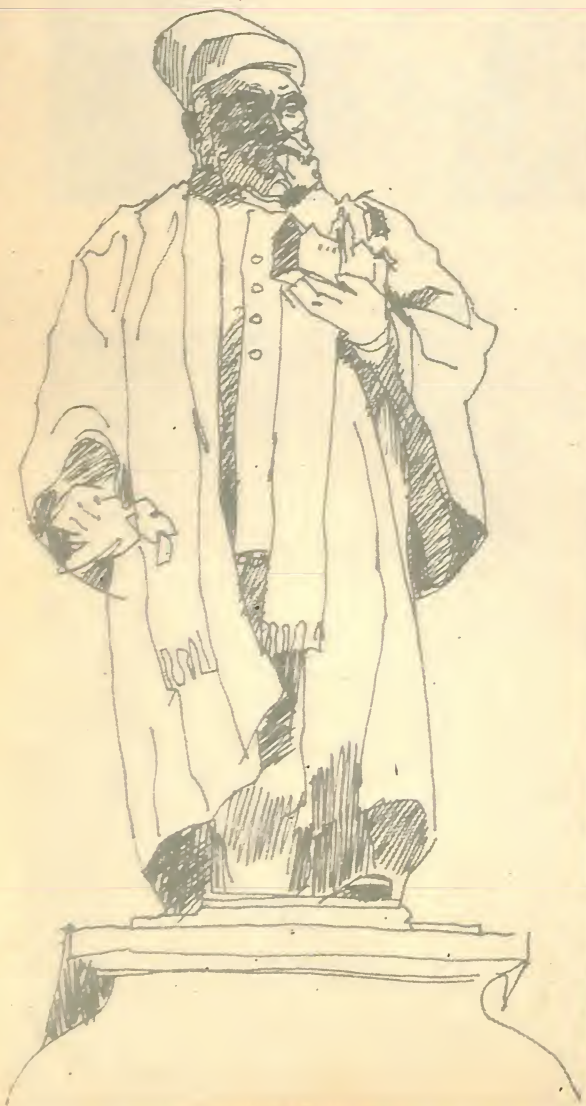
M G K Menon

A Ramachandran



Smt. Indira Gandhi (facing page)

S Bhagavantam (page 25)





Earth laughs in flowers

— Emerson



A Campus Vignette

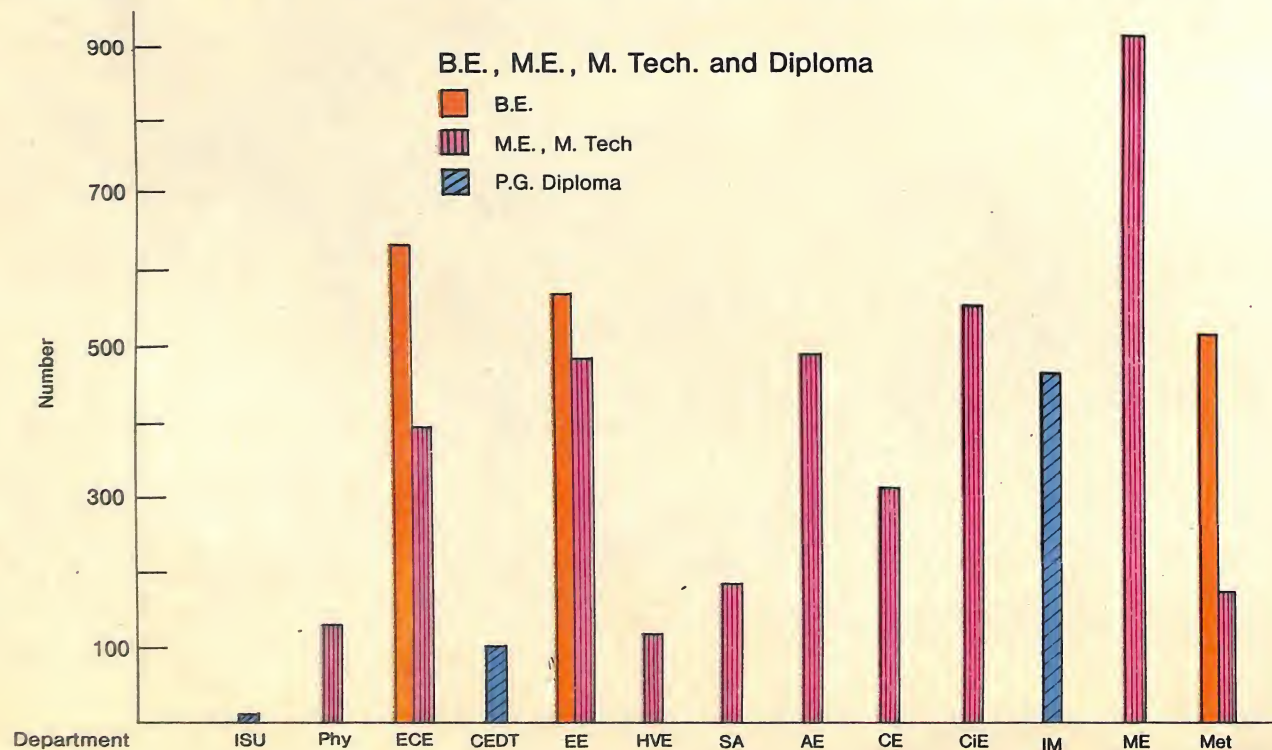
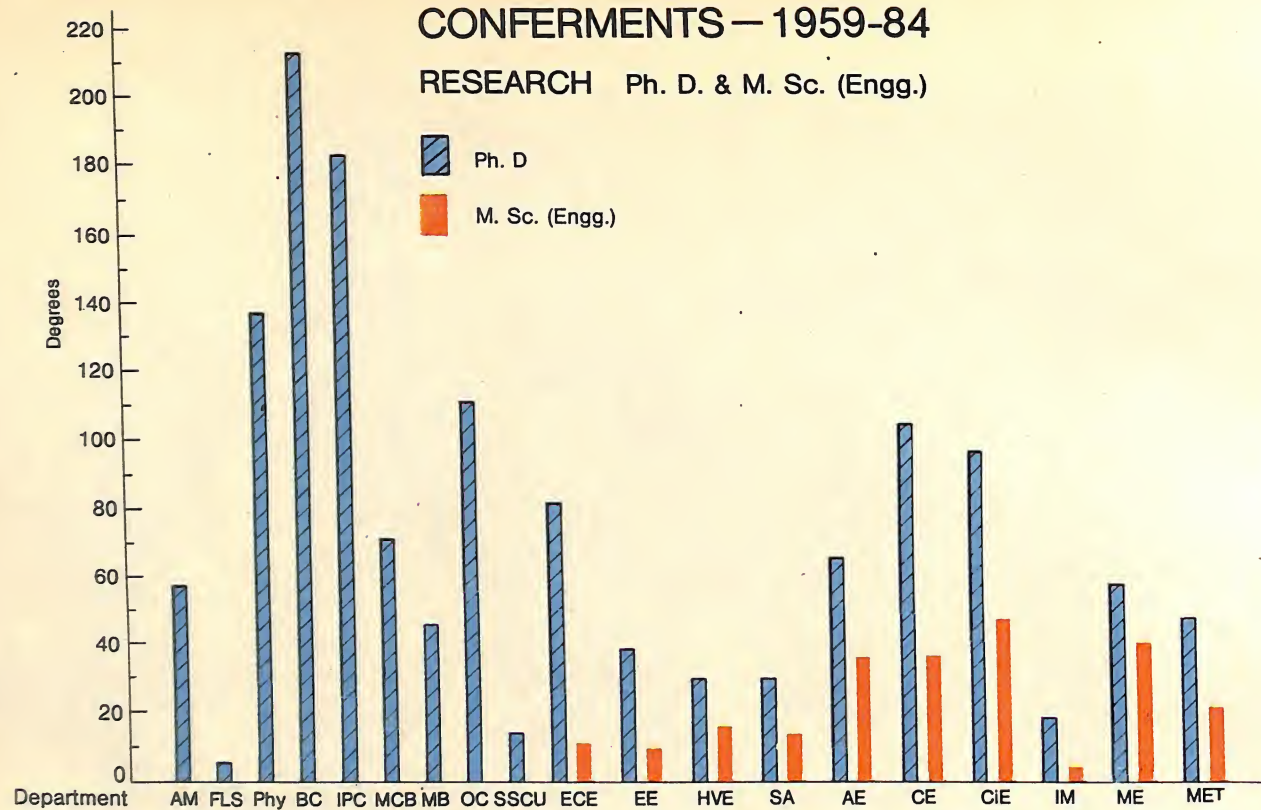
The Main Building

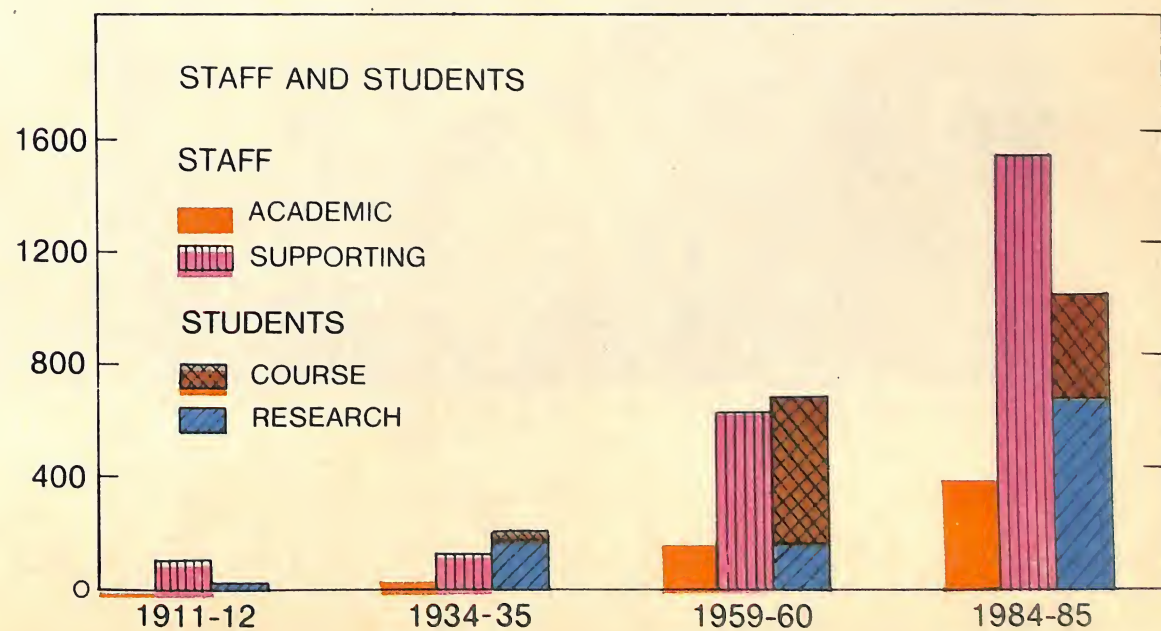
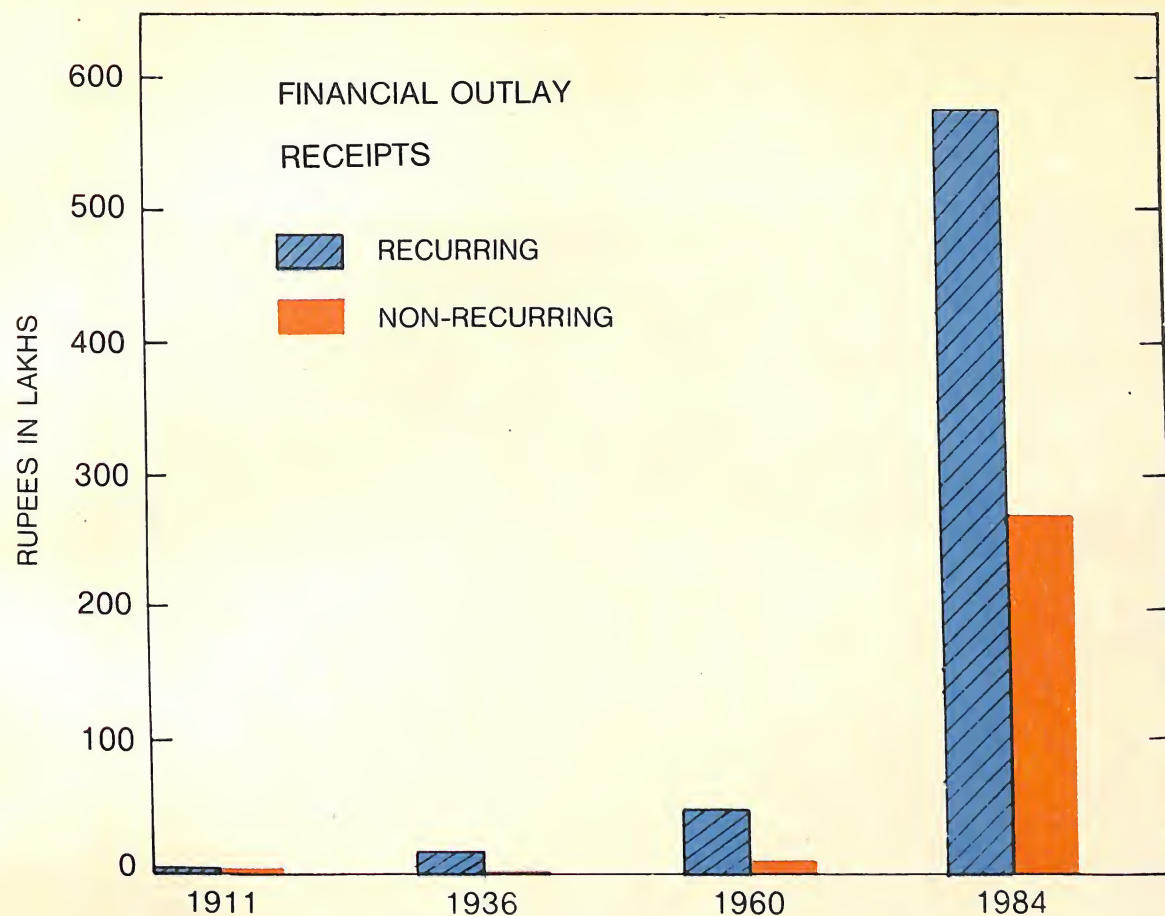


M.S. Chandrasekhar

CONFERMENTS — 1959-84

RESEARCH Ph. D. & M. Sc. (Engg.)







At Electrical Technology

July 13 1936

APPLIED MATHEMATICS

The major areas of research are Continuum Mechanics; Theoretical and Applied Science; Theoretical Physics, MHD and Plasma Physics; Integral equations and Operator theory.

The first research achievement of the department was the success of the B-G-K (Bhatnagar-Gross-Krook) model. To this day it is the most referred to model in the field of plasmas and rarefied gases. The benefit of secondary flows introduced to highlight the non-Newtonian effects is another significant contribution in the field of non-Newtonian fluids.

In Diffraction theory, Wiener-Hopf technique has been modified to handle mixed diffraction problems associated with acoustic and electromagnetic wave propagation.

The contributions in the field of non-linear waves include the iterative solution of a non-linear singular integral equation in the field of transonic flows. Quasilinear hyperbolic system of equations has been effectively approximated in the neighbourhood of a

bicharacteristic. Better algorithms have been developed for bottleneck assignment, generalised time minimizing transportation and bottleneck linear programming problems. New algorithms for fractional linear programming have been designed.

Numerical procedures for second order non-linear ordinary differential equations and coupled non-linear ordinary differential equations under two-point boundary conditions have been developed and applied to solve problems in fluid mechanics.

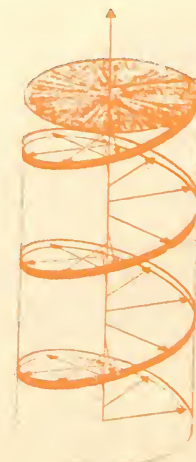
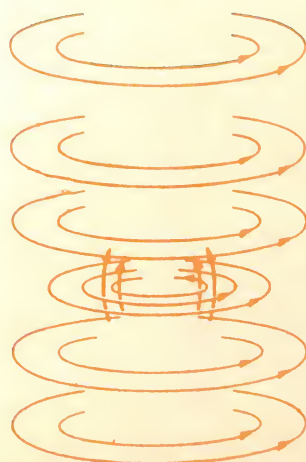
A new approach to the study of elementary particles and cosmological models has been made. In plasma physics the study of Alfvén surface wave propagating along the stratified interface or along the flux tubes in the solar atmosphere has been found important for understanding many solar plasma phenomena. Investigation on eigenvalue problems in integral equations led to applications in Radiative Transfer and Neutron Transport Theory.

ESTD : 1956

CHAIRMAN

PL BHATNAGAR	59-69
C DEVANATHAN	69-70
KP SINHA	71-73
	75-77
EV KRISHNAMURTHY	73-75
	77-78
G NATH	78

FACULTY	14
STUDENTS	
Research	17
STAFF	6
PUBLICATIONS 79-84	169



ESTD : 1921

CHAIRMAN

GJ FOWLER	21-25
RV NORRIS	25-30
V SUBRAHMANYAM	31-49
KV GIRI	50-58
PS SARMA	59-70
HR CAMA	70-76
J GANGULY	77-81
NR MOUDGAL	81-84
CS VAIDYANATHAN	84-

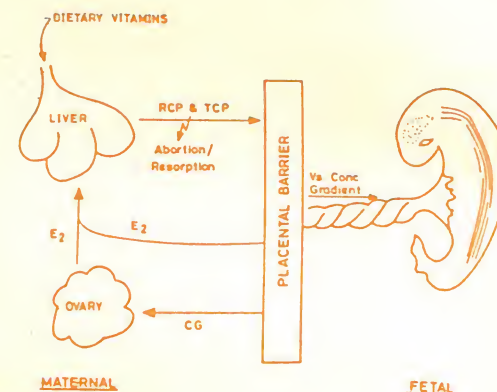
FACULTY	21
STUDENTS	
Research	104
STAFF	23
PUBLICATIONS 79-84	230

U.G.C. Centre for advanced study ICMR
Centre for advanced research in reproductive biology.

The oldest in the country, this department has made significant contributions in the areas of nutrition, proteins, microbiology, plant diseases, food technology, vitamins, metabolism, enzymology, antibiotics, cytogenetics and sanitation biochemistry.

Research groups in the major areas of proteins and enzyme mechanisms, lipids and biomembranes, endocrinology, molecular and developmental biology are involved in problems of national relevance: biodegradation of biomass and inborn errors of amino acid metabolism, environmental biochemistry and neurochemistry, reproductive biology and foetal development, genetic engineering, allergy and applied immunology and conversion of cellulosic wastes into useful products.

In the formative years, work on the activated sludge process of sewage treatment, retting of coconut husk for the production of coir and on the physiology of the lac insect led to the establishment of Lac Research Institute at Ranchi. Work on acetone fermentation and fermentation of mahua (*Basia longifolia*) flowers resulted in the establishment of factories at Nasik and Hyderabad for the manufacture of acetone. The department also played a major role



BIOCHEMISTRY

in setting up the Central Food Technological Research Institute at Mysore and was mainly responsible for founding the Society of Biological Chemists (India) in 1930 and the Journal 'Current Science' in 1932.

Cytogenetics :

It was shown that yeast cells during vegetative and reproductive phases exhibit well defined nucleoli and chromosomes with limiting membranes.

Antibiotics :

Work on the antibiotic principles of *Garcinia morella* led to antifungal antibiotics—the champamycins from the Champavati river soil, showed the chemotherapeutic properties of pterygospermin and benzyl isothiocyanate against viral infections.

Nutrition :

Preparation of soyabean and groundnut milk comparable to cow's milk and the development of a strain of tomato plant that yields fruits with a high content of β -carotene are examples of work on

nutrition. Yet another important contribution is the isolation and identification of the toxic principle of *Lathyrus sativus* (Kesari dhal) seeds, the causative factor of neurolathyrism.

Plant biochemistry :

Studies on trace elements, role of micronutrients such as silicon and manganese in plant nutrition, biosynthesis of valine and isoleucine and on the riboflavin metabolism contributed immensely to plant biochemistry. A systematic study on the metabolism of aromatic compounds in plants and microorganisms has led to the discovery of many new enzymes and novel reaction mechanisms.

Lipids and Biomembranes :

The role of retinol binding protein (RBP) in vitamin A transport and the involvement of vitamin A in cellular differentiation were investigated. Studies on the regulation of cholesterol biosynthesis led to the discovery of a protein — the "Fermodulin" which modulates the regulatory enzyme, hydroxymethyl glutaryl coenzyme reductase. Investigations on complex lipid synthesis in myelinating brain and on nutritional effects on developing brain yielded results of far reaching importance. It was discovered that administration of antihypercholesterolaemic drugs like clofibrate increase the content of mitochondria in liver and kidney. The absorption and metabolism of vitamin A and other lipids, structural and biological relationships of carotenoids and vitamin A, mechanisms of orotic-acid induced fatty liver in animals and the biosynthesis and metabolism of ubiquinone have been studied.

Enzymology :

The relationship between structural degeneration of enzyme Ribonuclease A and the accompanying loss of catalytic function has been established. Valuable information of the specificity of nucleic

acid-protein synthesizing mechanisms in living matter has been obtained. Studies on the regulation of enzymes by the microenvironment and on the mechanism of adaptation to drought in plants led to fundamentally important results.

Reproductive Biology :

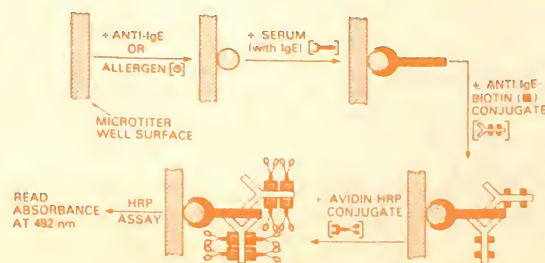
A study of the role of luteinizing hormone in induction of ovulation, implantation and maintenance of pregnancy in rodents and primates has led to an immunological approach to pregnancy termination. Isolation and characterization of specific proteins for transplacental transport of vitamins during pregnancy has led to the feasibility of an immunological approach to female contraception based on this fundamental discovery. In yet another study LHRH has been shown to be a regulator of chronic gonadotropin secretion in monkeys.

Molecular Biology :

Specific antibodies to oligonucleotides of known sequence have been prepared. Studies on the role of unusual bases in transfer RNA, expression of viral and plant genes using recombinant DNA technology, changes in chromatin structure in germ cells during spermatogenesis, genetic potential of liver cells in detoxifying xenobiotics and the factors regulating biogenesis of mitochondria have provided molecular insights into these biological processes.

Developmental Biology :

Plant hormone action, role of cyclic nucleotides in membrane phospholipid metabolism and biochemical mechanisms of adaptation to higher temperatures (Thermophily) are being studied. This group has isolated cellulolytic enzymes, from thermophilic organisms which are more stable and useful in bioconversion of cellulose to glucose. Allergens from silk worm have been isolated and methods developed to detect and control allergic reaction in humans.





CENTRE FOR THEORETICAL STUDIES

This Centre brings together scientists from diverse disciplines to promote interdisciplinary research on basic issues. The major areas of current interest are theoretical and mathematical physics, theoretical biology, developmental biology, genetics and ecology, fluid mechanics and the physics of the atmosphere and the oceans.

The theory of superstrong gravity developed has had far reaching implications on the understanding of the stability of elementary particles and that of the stability of the universe in the sense that it removes its singularity. A connection with other interactions, namely strong, weak, electromagnetic and weak gravity has been established. A gauge formulation for weak and strong gravity along with other forces has been accomplished.

A vacuum state of the universe has been formulated which is nonempty and is in a coherent state. This has impact on the fundamental interpretation of quantum mechanics, in particular, the non locality which has been confirmed recently. Other research groups elsewhere in the world are using this model.

Another important land mark has been the representation theory of physically important compact and noncompact Lie groups, study of dynamics and symmetry properties of classical and constrained systems. Extension of the Dirac relativistic generator formalism to encompass dynamical

choices of temporal variables has been achieved which describes the system of classical point particles with interactions.

Several new results have been obtained in the physics of solitons in quantum field theories. These include a method of finding exact soliton solution to coupled field equations, interactions between two solitons and quantum mechanics of interaction of fractionally charged solitons, and statistical mechanisms.

The problem of gauge hierarchy has been resolved by imposing super symmetry on the grand unification models.

In the study of the Asiatic monsoon, theoretical models of isolatable phenomena such as the influence of bottom topography have been developed. This has been strengthened by empirical studies using satellite data which suggest reversion of oceanic phase. These studies could help in improving the predictability of monsoons.

A model of population dynamics developed suggests the existence of two different kinds of males in various species. First, those who compete and the second who fall out of competition. Such male dimorphism has been discovered in a number of species ranging from insects to mammals.

Prof ECG Sudarshan has been associated with this Centre since its inception.

ESTD : 1972

CHAIRMAN

K P SINHA	72-73
	81 -
N MUKUNDA	73-79
R RAJARAMAN	79-81

FACULTY	9
STAFF	4
PUBLICATIONS 79-84	131

ESTD : 1949

CHAIRMAN

Mrs H KALE	49-52
	56-63
W GRAEFE	52-56
PC GANESHSUNDARAM	63-72
D THAKUR	72-74
Miss G CLAIRON	74-83
SJ SINGH	83-

FACULTY	7
STUDENTS	
Research	1
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PUBLICATIONS 79-84	22



FOREIGN LANGUAGES SECTION

Originally intended to be a translation unit, the FLS now offers courses in German, French, Russian, technical English and communication skills to nearly 400 students every year. Courses for persons in service and training workshops for translators and teachers of English, Japanese and Russian are organised. Audio-visual aids form a very important part of the instruction methodology. The section is collaborating with the British Council in evolving new and effective teaching techniques.

Research focus is on formal linguistic analyses of scientific and literary texts, aimed at capturing significant generalizations about the interplay between the human mind and the demands of communica-

tion in different realms of activity. Models for linguistic-stylistic and discursal analysis of texts, a grammatical framework for human-aided machine translation and a multilingual dictionary data-base to aid technical translation are among the significant results of the research done so far in the section.

Machine translation from English to Hindi and Hindi to Kannada, has been accomplished. A data-base for Japanese ideographs is being built, with the aid of a new minicomputer. The FLS also organises poetry readings, discussions and art exhibitions.

Facilities : A 5-booth language laboratory.

ESTD : 1911

CHAIRMAN

MW TRAVERS	09-11
HE WATSON	11-34
JC GHOSH	39-47
B SANJIVA RAO	47-50
KR KRISHNASWAMY	52-59
MRA RAO	59-71
TL RAMACHAR	72-73
AR VASUDEVA MURTHY	71-72 73-77
CC PATEL	77-80
VR PAI VERNEKER	80-83
S SATHYANARAYA NA	83-84
V KRISHNAN	84-

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Research	62
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PUBLICATIONS	415
79-84	

UGC Centre for Advanced Study

UNDP Assistance

INORGANIC AND PHYSICAL CHEMISTRY

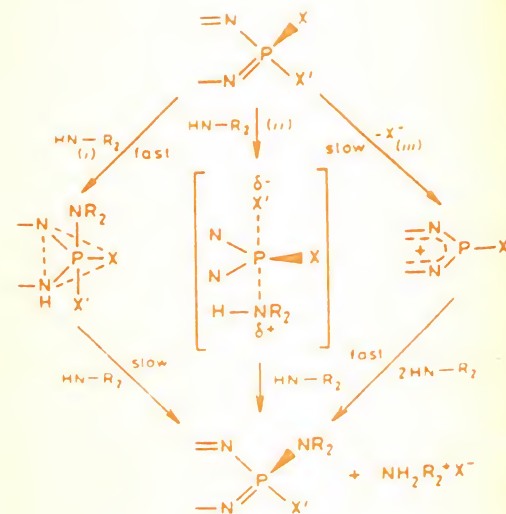
In the early years (prior to 1960), the Department carried out extensive research work on technical gas reactions, adsorption, catalysis, high-pressure chemistry, colloid chemistry, electroplating of metals and alloys, corrosion and its prevention and mineral beneficiation. These investigations led to the development of new products and processes and paved the way for establishing many industries.

During the 60's, the Department moved into many new areas and the research effort was focussed on surface chemistry, membrane-transport, polarography, molecular structure, solid state chemistry, chemical behaviour of sulphur compounds, non-aqueous solvents, coordination chemistry of transition metals and lanthanides and geochemistry. Electrochemical research was strengthened and single crystal X-ray crystallographic studies were initiated.

Since 1970, the scope and extent of the research activity have been considerably enlarged. The department has made significant contributions to non-metal chemistry. The syntheses of numerous cyclophosphazenes including novel bicyclic and spirocyclic derivatives have been accomplished

and their structures elucidated by NMR spectroscopy and X-ray crystallography. From kinetic studies on these systems, both associative and dissociative pathways have been identified. Elegant methods have been evolved for the preparation of several important fluorine compounds of sulphur, phosphorous, nitrogen and silicon and hexafluorophosphates by using pyridinium poly (hydrogen fluoride) as a new fluorinating agent. Model systems have been developed for the study of coordinative and molecular interactions involving porphyrins, chlorophylls and crownethers. These studies provide a convenient approach for the elucidation of the mechanisms of photosynthetic electron transport and cation transport across biomembranes.

Crystallographic studies of metal complexes of biologically important ligands (e.g. nucleotides) have yielded valuable information regarding the mode of metal binding to DNA. The coordinative behaviour of hydrazinium ion in different transition metal derivatives has been unravelled and correlated with differences in their reactivity. Extensive studies of lanthanide complexes have revealed interesting geometries with varying coordination numbers (6-10) depending upon the nature of the



multidentate ligands employed. Chlorine 35 NQR measurements with a home-made spectrometer have been used as a structural tool for several metal chloride complexes.

Mineralogical and geochemical studies show that magnetite deposits, gold and copper ore bodies in Archaean rocks of Karnataka are of hydrothermal origin whilst asbestos in carbonate rocks of Andhra Pradesh are of stylolitic origin.

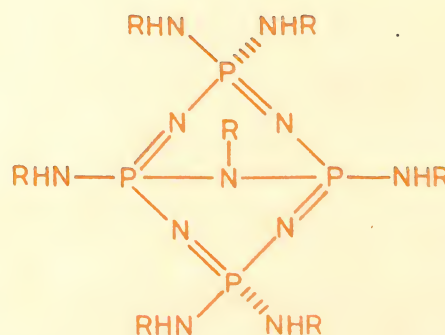
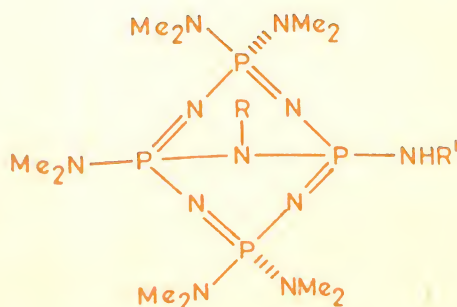
Electrochemical studies of primary and secondary battery systems as well as of corrosion systems of practical relevance have been carried out. Insoluble anodes for electrosynthesis have been developed. Several theoretical approaches have been formulated for modelling the challenging problems of chemisorption and electron-transfer at charged interfaces. Quantum chemical studies of molecular interactions in the excited state and vibrational spectral analysis of thiocarbonyl compounds have been carried out. Structural aspects and defect states have been correlated with the physical properties of several inorganic solids in the

context of their applications in optical displays and as electroceramics. Precursor methods for prevoskite-type oxides and ferrites have been standardised.

The role of condensed phase reactions in understanding combustion, degradation and ageing of propellants has received considerable attention. Studies in polymer chemistry include the synthesis of new cross-linked thermally stable phosphazene polymers, the effect of fire-retardant additives on the flammability of organic polymers, kinetics of vinyl polymerization and solution properties of random copolymers.

The Department has interacted with Industry and the know-how generated has been transferred for the production of silicon based materials, nickel-cadmium batteries, magnesium dry cells and solid rocket and missile propellants.

As for its future plans, the Department lays stress on initiating and intensifying research work in the areas of chemical dynamics, catalysis, organometallic chemistry and energy related studies.



ESTD : 1941

CHAIRMAN

PHARMACOLOGY

NN DE	41 - 52
M SIRSI	52 - 68

FERMENTATION TECHNOLOGY

M SREENIVASAYA	42 - 53
JV BHAT	53 - 68

MICROBIOLOGY AND PHARMACOLOGY

JV BHAT	68 - 72
T RAMAKRISHNAN	72 - 75

MICROBIOLOGY AND CELL BIOLOGY

T RAMAKRISHNAN	75 - 82
G RAMANANDA RAO	82 -

FACULTY 8

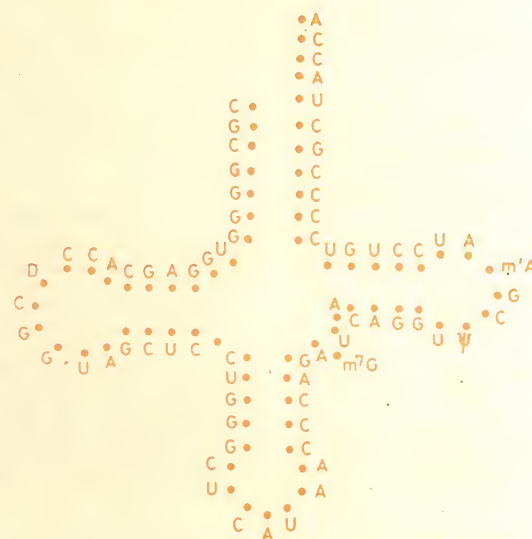
STUDENTS
Research 31

STAFF 17

PUBLICATIONS 79 - 84 80

U G C Special Assistance

COSIST Grant



MICROBIOLOGY AND CELL BIOLOGY

Microbiology and Cell Biology Laboratory is concerned with problems of human relevance in basic biology. It has distinguished itself in the world of science, for its work, spanning over two decades, on the genetics and molecular biology of mycobacteria. Microbiology of silk worm diseases, molecular biology of drug resistance in *Mycobacterium tuberculosis*, immunity and drug action in dermatophytic fungi are a few of the research programmes that the Laboratory has pioneered in.

Scientific work has been pursued in the fields of experimental cancer, biochemistry and immunology of silkworm and pathogenic fungi, molecular basis of drug action, biochemistry and genetics of animal viruses, biological nitrogen fixation, structure and regulation of human and other eukaryotic chromosomes and clonal propagation and molecular aspects of differentiation of plants in tissue culture.

The Laboratory is now venturing into newer areas in Biotechnology, namely, Genetic Engineering and Immunotechnology.

Development :

The outside community has looked to MCBL for expert opinion on retting of coir, silkworm diseases, pesticide degradation, testing of antimicrobial compounds, assessment of drugs, microbiological testing of water samples, counselling in human genetic diseases and training of personnel in cell culture and recombinant DNA techniques.

Facilities :

Liquid scintillation counters, ultracentrifuges, HPLC, spectrophotometers, fluorescent microscopes, French pressure cell, CO₂ incubators, ultralow temperature freezer and lyophiliser.



ESTD : 1911

CHAIRMAN

JJ SUDBOROUGH	11-13
HE WATSON	13-16 19-27
JL SIMENSON	16-19
PC GUHA	29-52
DK BANERJEE	54-71
MV BHATT	71-74
GS KRISHNA RAO	74-77
TR KASTURI	77-80
PK BHATTACHARYYA	80-82
GSR SUBBA RAO	82-

FACULTY	9
STUDENTS	
Research	52
STAFF	21
PUBLICATIONS	272
79-84	
UGC Special Assistance	

ORGANIC CHEMISTRY

The Department of Organic Chemistry is among the oldest of its kind to be instituted in this country. It was separated from its parent department, the Department of General Chemistry, at a time when organic chemical research had reached a stage of consciousness of its own maturity. The period of the existence of the Department has coincided with several sea-changes in the development of the science.

The investigations carried out in the essential oils field in the early period had a direct bearing on the development of sandalwood oil extraction and turpentine manufacture in the sense that the extraction processes then involved in research had a spin-off in so far as trained personnel became available at a time when these industries were being established in the country. During the second world war, many chemicals required for the war-effort were made on the required scale in the Department, since the infrastructure for making them was practically non-existent in the country.

In the later years, the structures of several potent natural hormones were determined and synthesised stereospecifically and the effect of modifica-

tions of the structures elucidated. Thus a number of stereospecific total syntheses of steroid hormones were achieved and certain modified steroids were prepared for the purposes of developing contraceptive formulations. Many processes were developed and handed over to industry, virtually on a turn-key basis, for the manufacture of these hormones.

Pheromones are chemical reagents which can induce specific types of insect behaviour, especially the mating behaviour, and hence they find increasing use as powerful biological agents for insect control which do not pollute the environment. The Department has been successful in the syntheses of key juvenile hormones which control a stage in insect metamorphosis. It is anticipated that further research in this field can help in the preservation of food grains from insect attack, and more positively in inducing metamorphosis at a controlled time in the rearing of silk worms.

At a basic level, research has been carried out in elucidating reaction mechanisms, determination of structures of complex products, synthesis of natural products, etc. In medicinal chemistry, synthesis of a series of compounds of progressively modified

IISc 1909-1984

structures have been undertaken to derive information on structure-activity relationships.

Among the newer sections instituted and developed are : a unit for the study of photochemically induced reactions ; a unit for development of methods of microbiologically modifying specific structures and rendering these methods capable of industrial application ; a unit for the study of reactions induced on molecules constrained in specific orientations by means of micelles or complex-formation.

Contributions encompassing purely theoretical and computer-aided calculational aspects, physico-chemical constructs, including the engineering of specific structures for testing theories, the development of new reagents, organo-metallics, the elucidation of specific steps in complex reaction mechanisms and the determination of mechanisms of reactions in living systems and bio-synthetic pathways have been made. These include correlations of the propagation of substituent effects in non-planar systems, the applications of the Vilsmeier-Haack reaction, structure-determination of complex by-products in oxidations with high-potential quinones, the exploitation of the Beckmann rearrangement, a study of the oxidation of aromatic rings, the photochemistry of thiones, the use of singlet oxygen as a reagent, the use of the metal ammonia

reaction and cycloaddition sequence for creating appropriate synthons of natural products, X-ray crystallographic determination of structures of drugs, of special small molecules, of arrangements in crystals conducive to photoreactions in the solid state, etc.

Important contributions in the bio-organic field have been in establishing the mode of degradation of acyclic monoterpenes in various isolates, in the characterisation of 11-hydroxylation of progesterone in *A.ochraceus*, microbiological conversion of 19-hydroxy cholesterol, localization of strychnine-glycine and bicuculline—GABA receptor sites on motoneuron membranes by fluorescence and ferritin labelled antibody techniques, transformations of terpenoids and alkaloids, etc.

Facilities :

Recording ultraviolet and infrared spectrophotometers, automatic elemental analyzer, nuclear magnetic resonance spectrometers, gas-liquid chromatographs, high performance liquid chromatographs, ultra centrifuges, liquid scintillation counter, nanosecond spectrophotometer, steady state fluorimeter, several photoreactors, ozonizer, spinning-band distillation column, autoclaves, laboratory scale automatic fermentors, X-ray diffraction equipments.

"...brilliance has an obligation not only to create but also to communicate. A scientist cannot really go voyaging through strange seas of thought alone. The more penetrating eye will see him to be surrounded by a cloud of witnesses. He takes from others ; he gives to others. He must address the problems of time. He must translate his thoughts into the language of his contemporaries. He must scatter them abroad for interaction. A thought which has not penetrated to other minds will die unfruitful."

— JR Platt

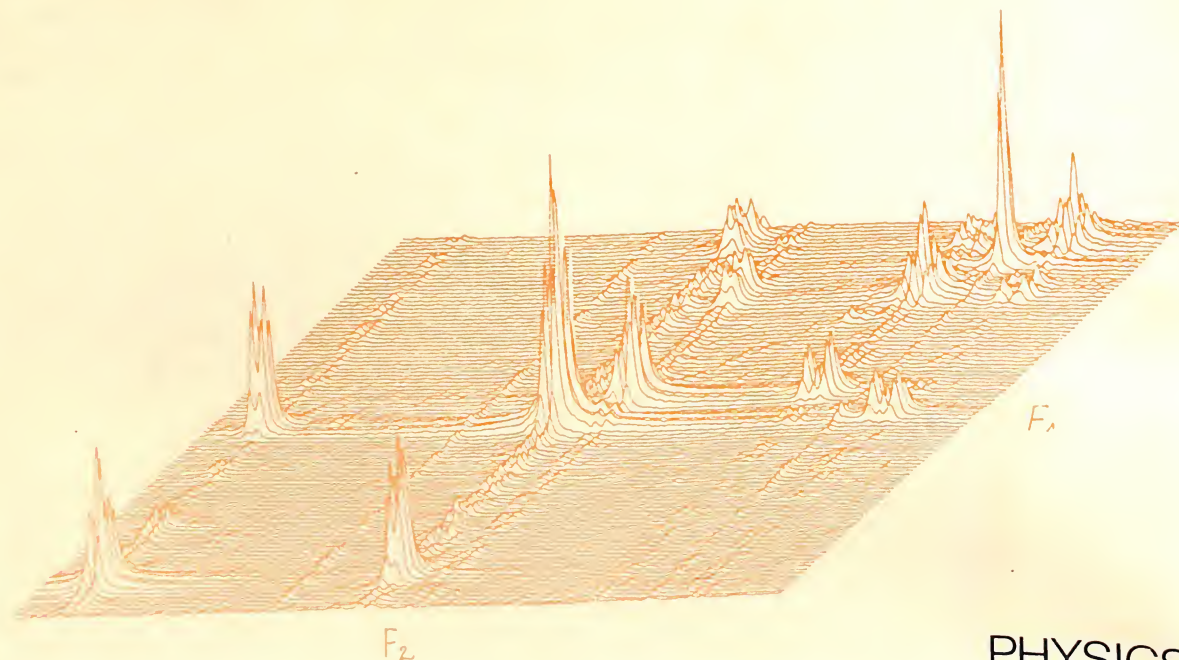


ESTD : 1933

CHAIRMAN

CV RAMAN	33 - 48
RS KRISHNAN	48 - 70
PS NARAYANAN	70 - 74
VS VENKATA-SUBRAMANIAN	74 - 76
ES RAJA GOPAL	76 - 79
G SURYANARAYANAN	79 - 81
R SRINIVASAN	81 - 84
MA VISWAMITRA	84 -

FACULTY	28
STUDENTS	
Research	69
M Tech	16
STAFF	34
PUBLICATIONS 79 - 84	272
U G C Special Assistance	



PHYSICS

CV Raman set the tradition and provided the leadership for the pioneering work of the department, in Optics and Spectroscopy. The Raman-Nath theory of diffraction of light by ultrasonics, Brillouin scattering, second order Raman scattering, anomalous scattering of X-rays, structure and scattering of Diamond are a few of the highlights of the scientific contributions in the first three decades.

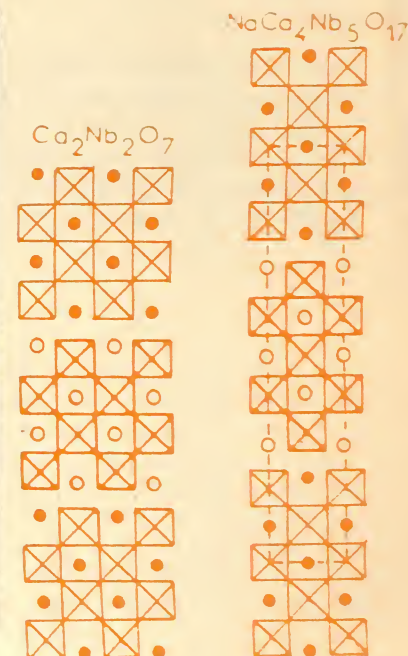
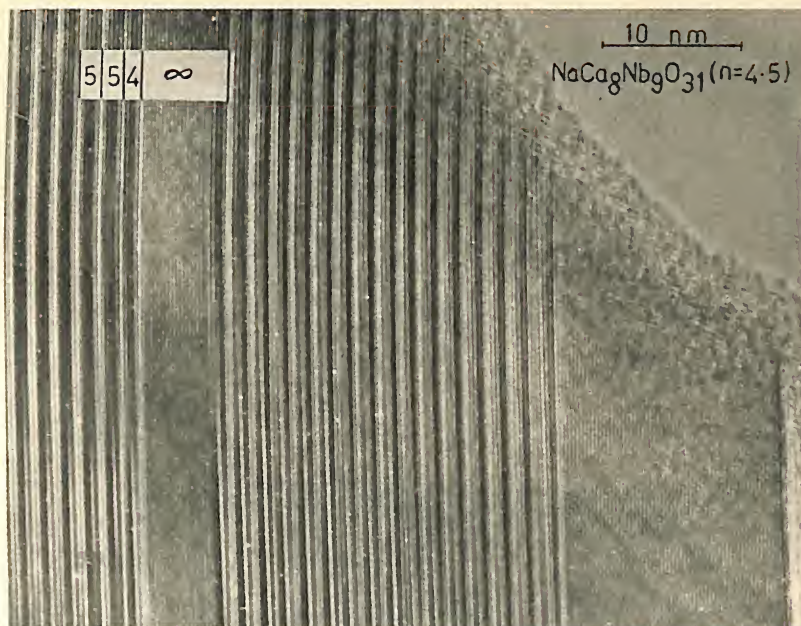
In the following years the lofty tradition has been continued both in experimental and theoretical research, over a wide gamut of areas, linked by the common thread of condensed matter Physics: magnetic resonance, critical point phenomena, high pressure and low temperature studies, lasers and spectroscopy, dielectrics and ferroelectric materials, semiconductor physics, X-ray crystallographic and NMR studies of biological systems, cryogenics, mass spectrometry, nuclear geology, theoretical studies of crystalline and amorphous solids, plasma physics, gravitation, field theory and particle physics.

Work is planned on application of a variety of physical techniques to biological problems at the molecular level, ultralow temperatures, phonon physics, experimental plasma physics, physics of glassy materials, studies of small systems, non-linear laser spectroscopy and time resolved picosecond spectroscopy, study and simulation of chaos, and astrophysics.

A process for the production of semiconductor grade silicon and related silicon based chemicals has been developed and the technology transferred to an industry. Development work in cryogenic thermal insulation has also resulted in transfer of technology for the manufacture of liquid nitrogen containers.

Facilities :

Cryogenic plants for producing liquid nitrogen and liquid helium, a single crystal X-ray diffractometer, facilities for crystal growth, and quartz and glass spectrographs.



ESTD : 1976

CHAIRMAN

CNR RAO 76-84
J GOPALAKRISHNAN 84-

FACULTY 10
STUDENTS 24
Research 24
STAFF 24
PUBLICATIONS 79-84 233

UGC Special Assistance and COSIST
DST—Intensification of Research in
high priority areas.

SOLID STATE AND STRUCTURAL CHEMISTRY

Solid State and Structural Chemistry is a newly emerging discipline with a focus on research work in a number of frontier areas of chemistry.

SSCU has the best surface science laboratory in the country and has been investigating a wide range of problems related to surface science. It has facilities to do photoelectron spectroscopy both in UV and X-ray regions, Auger spectroscopy, Electron energy loss spectroscopy etc.. Some of the important research contributions are the investigation of the satellite phenomenon, valence electron states and reaction pathways, particularly on catalyst surfaces. Photoelectron spectroscopy has also been used with benefit in the study of metal-insulator and spin state transitions in solids. The Auger intensity ratios have been used in the investigation of the nature of chemical bonding. The phenomenon of interatomic Auger transitions has also been investigated in detail. Theoretical models based upon sudden

approximation and molecular quantum chemical calculations have been made use of in interpreting a variety of experimental results.

The Unit has laid an emphasis on the importance of synthesising new materials. Development of new techniques has formed the core of the research activities of this Unit. Materials with the designed structures and tailored properties have been synthesised using such techniques. Structural investigations have been carried out using high resolution electron microscopy. Long period structures involving coherent intergrowth in the metal oxides, intergrowth tungsten bronzes, Aurivillius phases etc. have been investigated in detail.

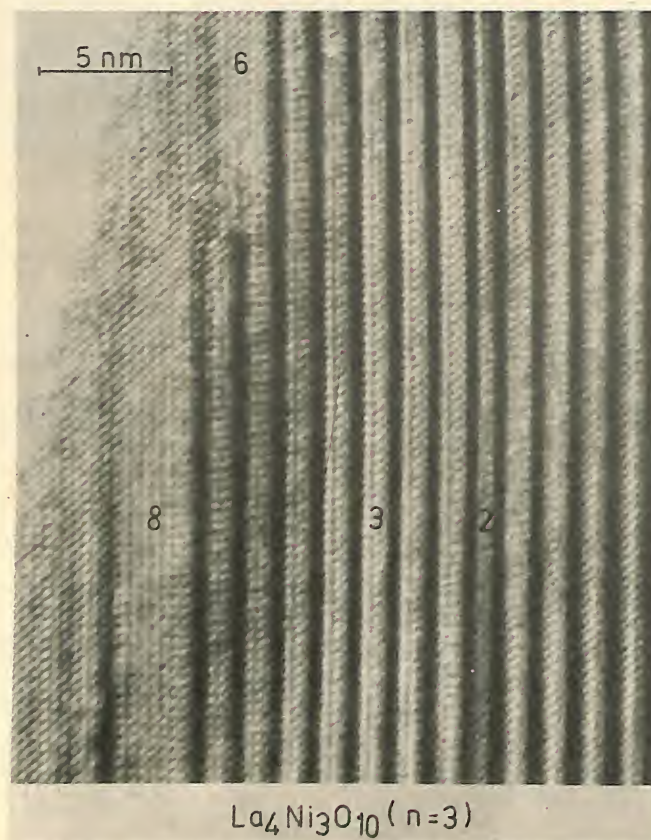
Among the less understood areas of solid state chemistry are those related to amorphous solids. The laws that govern their structures, stability and their transport properties are among the least understood. The Unit has made investigations in a

variety of glasses characterised by different types of bonding. Significant contributions have been made in understanding the phenomenon of glass transition.

The Unit has developed new techniques for making physical measurements. A sensitive photoacoustic spectrometer, built at the Unit, has been used in the study of phase transitions and catalyst surfaces. The Unit has also established facilities for investigating local structures in amorphous mate-

rials and catalysts by making use of X-ray spectroscopy (EXAFS and XANES).

The Unit has programmes in theoretical chemistry for studying phase transitions. Computer simulation has yielded significant information related to plastic crystal transformation and the behaviour of super cooled liquids. The Unit is also engaged in research programmes related to energy conversion. Indeed, the recently developed carbon electrodes have found promising application in hydrogen-oxygen fuel cells.



AEROSPACE ENGINEERING

Aerospace Engineering came into being as a Department of Aeronautical Engineering during the second World War, along with the first aircraft industry in the country. Since then the Department has played a prominent role in providing the intellectual leadership and professional manpower for national programmes in aerospace science and technology. It has been closely associated with design projects for aircraft at Hindustan Aeronautics Ltd (HAL) and Satellite Launch Vehicle at the Indian Space Research Organization (ISRO); there are collaborative research programmes in helicopter engineering with HAL and the National Aeronautical Laboratory.

Research activities in the Department fall into four major areas: Fluid flow studies, Structural and material studies, Aerospace propulsion and aspects of Aerospace dynamics and systems. There are, however, clear subdivisions within each of these areas, as also topics that cut across these demarcations.

Fluid Flow :

Fluid flow studies comprise of basic flow problems, applied aerodynamics, gas dynamics, high enthalpy aerodynamics and mechanics of the atmosphere. Frontline work has been conducted in many of these areas, particularly on boundary layer transitions, and high level expertise has been achieved in the applications of aerodynamics. Such modern areas as computational fluid dynamics have gained a firm foothold.

Structures :

Structural mechanical studies have the major subdivisions of analysis and design, structural integrity evaluations, composites and dynamics. Leading work has been done in the application of finite-element techniques to the analysis of complex structures including pin and bonded joints, plates and shells made on both metallic and composite materials, with and without cutouts. Fatigue

and fracture analyses, nondestructive material evaluation, dynamic and aeroelastic analyses of aeronautical as well as industrial structures and composites are amongst the thrust areas in the Department's work.

Propulsion :

Propulsion research is carried out both on the science and engineering of combustion and propulsion systems, and on the chemistry of propellants. Additives for burning rate control of solid composite propellants, hybrid rocket fuel synthesis, thermochemistry of fuel-oxidiser systems, hydrazine-based liquid fuels, flame studies in boundary layer flows, droplet combustion and computer simulation of reacting flows are established areas of work.

Guidance and Control :

Aerospace guidance, control and dynamical studies cover both atmospheric flight as well as space vehicles. Areas of major activity are: analysis of dynamics and control of rigid and flexible spacecraft, rocket and space vehicle trajectory optimisation, radar-based guidance systems including antenna and signal processing aspects, avionics and navigation, flight safety including weather effects, remote sensing and coding techniques and implementation. Computer architecture for guidance and navigation systems, and its microprocessor implementation, form an active area of work.

Resonance, rotor stability and coupled rotor-airframe models of helicopters form the major area of work in helicopter engineering.

Evaluation of aircraft airworthiness is an inter-disciplinary area of work.

Development :

Significant contribution has been made towards the development of electronic infra-red sensors, rocket

ESTD : 1942

CHAIRMAN

VM GHATGE	42 - 45
RG HARRIS	45 - 48
OG TIETJENS	48 - 55
S DHAWAN	55 - 62
CV JOGA RAO	63 - 69
TN KRISHNASWAMY	69 - 80
VK JAIN	80 - 83
R NARASIMHA	83 - 84
S DURVASULA	84 -

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payloads and guidance packages of missile applications.

Special burners for stress-relieving of large vessels, highly loaded solid composite propellants, hypergolic solid fuels for hybrid systems and hydrazine based storable liquid fuels have been developed.

Extensive wind tunnel tests of aircraft models, cooling towers, chimneys, bridges and buildings have been undertaken at the request of various users. More recently, tests have been conducted at high Mach numbers and temperatures for space applications. Design and development of a single seat gyro-copter and a hovering platform are significant achievements in the development of flight vehicles.

Facilities:

Facilities:

There are two large low-speed wind tunnels, several small wind tunnels for the study of flutter, boundary layers and turbulence, two intermittent supersonic wind tunnels and two shock tubes, for the investigation of compressible flow problems. The 4.3 m x 2.7 m rectangular test-section low-speed wind tunnel is the largest in the country. A hypersonic wind tunnel of 200 mm diameter test section is nearing completion.

An instrumented impulse hammer, a material testing system with programmable loading and acoustic emission test equipment are available in the structures laboratory.



CHEMICAL ENGINEERING

ESTD : 1943

CHAIRMAN

<i>M GOVINDARAO</i>	47-49
<i>SK NANDI</i>	49-51
<i>SS GHOSH</i>	51-54
	58-59
<i>E WEINGARTNER</i>	54-58
<i>NR KULLOOR</i>	60-70
<i>DS VISWANATH</i>	70-75
<i>R KUMAR</i>	76-80
<i>G NARSIMHAN</i>	81-83
<i>PK DESHPANDE</i>	83-

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Research	25
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To keep pace with the phenomenal growth of chemical industries in post-independent India, it became necessary to generate schools of excellence in research and higher learning in chemical engineering. This department addresses itself to the problems requiring deep understanding of complex phenomena taking place in a chemical reactor which is the heart of a chemical industry. In addition, it investigates other problems associated with the running of chemical industries like environmental pollution control or generation of knowledge in the newly developing areas of chemical engineering like bioengineering.

In the sixties, catalyst development and reaction kinetics were actively pursued and scores of catalysts developed for homogeneous and heterogeneous reactions. In the seventies, the focus shifted to the analysis of reactors. More recently, a variety of chemical reactors of industrial relevance have received attention.

Original theories have been developed for multi-phase systems, particularly fluid-fluid dispersion and gas-liquid contacting. These include bubble and drop formation, gas dispersion from sintered discs, bubble growth during nucleate boiling, and foam beds.

The two-stage model for bubble formation analysed the phenomenon quantitatively, and led to a unified model for bubble and drop formation through a single set of equations. The only model

available in literature on gas dispersion in liquids from sintered discs has been proposed. The equilibrium model for heat transfer during nucleate boiling predicts the bubble-growth history and the final vapour bubble diameter. Foam bed contactors have been theoretically analysed taking into account the foam structure. The proposed models predict the performance of foam bed contactors and the liquid hold-up in semi-batch and co-current foam beds.

In the earlier years, the thermodynamic properties of about fifty pure substances and a few non-reacting systems were evaluated from empirical correlations. The emphasis has shifted in recent years to the critical analysis of empirical correlations, development of semi-empirical correlations, and experimental determination of basic properties at moderate temperatures and pressures.

Recent investigations have resulted in the development of modified polymers for specific purposes, processes for the removal and recovery of cyanides, thiocyanates and metals from industrial waste water, and immobilised enzymes for converting starch to glucose.

A complete design of a plant for the manufacture of copper sulphate from chalcopryrite ore-concentrate, involved the design of a 75 sq. ft. fluidised-bed roaster, so far the largest size designed within the country.

A Campus Vignette

Chemical Engineering



ESTD : 1950

CHAIRMAN

POWER ENGINEERING

NS GOVINDA RAO 51-61

CIVIL AND HYDRAULIC ENGINEERING

NS GOVINDA RAO 61-67

K SEETHARAMAIAH 67-72

CIVIL ENGINEERING

KTS IYENGAR 72-74

BV RANGANATHAM 74-77

NS LAKSHMANA RAO 77-79

A SIVA REDDY 79-81

PRAKASH DESAYI 81-83

K CHANDRASHEKHARA 83-84

A SRIDHARAN 84-

FACULTY 27

STUDENTS 47

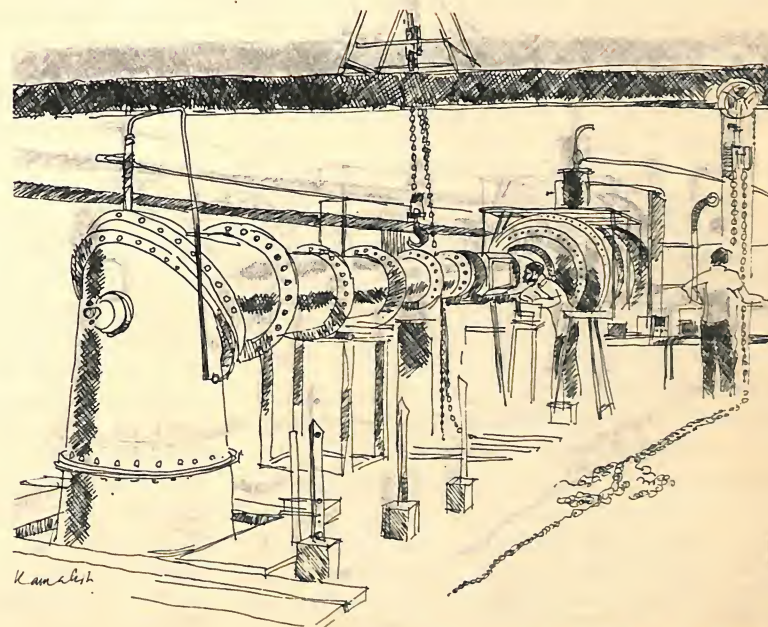
Research 47

M E 31

STAFF 37

PUBLICATIONS 79-84 165

U G C Special Assistance



CIVIL ENGINEERING

The Department of Civil Engineering, has kept pace with the technological plans and development goals of the nation.

Geotechnical :

The geotechnical Engineering group has made significant contributions in the areas of soil strength, stability and settlement problems, strength and structural behaviour of foundations. Mechanisms controlling the behaviour of clays at microlevel have

been unravelled and this has led to correlations between micro-and macro-behaviour. A unified approach has been developed to identify the nature of soil system and predict the volume change behaviour through state parameters.

Significant contributions have been made in stability analysis of natural and retained slopes, bearing capacity of shallow and deep foundations, flexural and buckling behaviour of piles and pile groups

and settlement and load transfer mechanisms in deep foundations.

Pioneering work on collapse load estimations of foundations and slabs on ground, has been carried out paving the way for limit state designs of foundation structures. A simple procedure of designing embedded foundations subject to dynamic loads has been developed based on the dependency of the dynamic shear modulus on strain.

Hydraulic :

Weirs - proportional, hydro - foil, stream lined triangular profile and finite crest width, developed here are incorporated in the specifications of Indian and International Standards Organizations. Investigations on entrainment of air into free surface flows has attracted scientific attention. Sediment transport, salinity intrusion into surface and ground waters, dissipation of heat and spread of buoyant and nonbuoyant jets into ambient quiescent water bodies, inception of damage due to cavitation and its relationships with the material characteristics have been studied. Investigations on cavitating and non - cavitating performance of centrifugal pumps, flow and vortex rope in the draft tube of Francis Turbine runners, failure modes and their prevention in reciprocating hand pumps employed in rural drinking water supply, have been studied.

The analysis and design back up provided for the first indigenous surge protection system for the water supply pumping mains of Bangalore led to offer of technical advice for a number of prestigious water supply schemes throughout the country. The feasibility studies undertaken here have helped in storage schemes for the irrigation of dry crops at critical stages in their growth, even at the level of an individual farm. Systems approach to effective utilisation

of water in reservoirs for hydropower production as well as irrigation has aided in drawing up improved operating policies and regimens. Experience gained in modelling for regional ground water simulation in the Vedavati river basin in Karnataka and Andhra Pradesh have been utilised in the corresponding formulation for the Narmada valley project, aided by the World Bank.

Structural :

The structural engineering group has wide ranging interests : Linear and Non - Linear problems in elasticity and plasticity with a wide range of engineering applications have been looked into. Analyses of deep beams, thermal stress in plates and cylinders, orthotropic plates and shells of various forms have helped the Indian construction industry and consultancy out-fits gain international acceptance and recognition.

The Indian standard code on reinforced concrete has been modified to reflect some of the findings of the department in the field of concrete constructions. Studies on vibrations and frequency analysis of bridges and dynamic response of structures under moving loads have broadened into earthquake engineering and random vibrations. Generation of spectrum compatible accelerogram and a novel multi - parameter classification and risk rating of earthquakes are of significance. The response of inelastic structures to earthquakes have been taken up.

Techniques have been developed to produce two and three dimensional homogeneous and composite photo - elastic models using locally available epoxy resins. An experimental - numerical hybrid technique has been developed for stress analysis in models.



ELECTRICAL COMMUNICATION ENGINEERING

ESTD : 1946

(1923 - as Section of ET)

CHAIRMAN :

K SREENIVASAN	46-59
SVC AIYA	59-69
BS RAMAKRISHNA	69-74 78-79
NS NAGARAJA	74-77
NN BISWAS	77-78
Mrs R CHATTERJEE	79-81
BS SONDE	81-

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Teaching and Research in Electronics and Communication Engineering commenced at the Institute in the early twenties, and since then the Department of Electrical Communication Engineering has maintained its leading position in the Country by its significant contributions to this field.

During the late forties when a separate building came into existence for the Department, Microwaves, Vacuum tubes, Electronics, Acoustics and Line and Radio Communication laboratories were setup to conduct research in these areas. Some of the significant contributions through research came in the areas like, microwave components and assemblies, new vacuum and gas-filled tubes, drums and vibrations, relative efficiencies of Indian languages, ionospheric studies, analog computers etc. In the late fifties, new activities were added to the Department. Studies in atmospheric radio noise and lightning conducted in this period have contributed greatly to the understanding of meteorological phenomena and their implications in the planning of radio communication in tropical latitudes. Other significant achievements include studies in dielectric and other antennas at microwave frequencies, electronic instrumentation, solid-state electronics, architectural acoustics, and digital computers, all of which greatly assisted the growth of these areas, both in R & D and industry, in India. A new Acoustics laboratory with anechoic and reverberation chambers was also added.

Growing interest in information processing and digital/optical technologies prompted R & D activity in SAW devices, Speech and Optical Signal Processing, YIG Devices in the seventies, and the Department has done commendable work in these areas.

In this same period, the Department has also set up the Centre for Electronics Design Technology (Indo-Swiss joint activity) to provide vitally needed training to engineers from industry.

Setting up of R & D facilities in underwater Acoustics and Signal Processing, Design and Technology of Composite Materials, Thick and Thin-film Hybrid Microelectronics, Optical Communications including integrated optics and Microprocessor-based Instrumentation are some of the recent achievements of the Department which have helped in furthering research work of current interest.

In line with world-wide recognition, the activities of the Department are now organized in seven distinct areas, viz., Acoustics, Speech and Signal Processing; Communications; Computers-Software and Hardware; Electro-magnetics, Microwave Theory and Techniques, Electronic Circuits, Measurements and Instrumentation, Electronic Materials and Devices and Optical Communications. This has helped the Department in expanding its research activity.

ESTD : 1911

CHAIRMAN

ALFRED HAY	11 - 22
CATTERSON SMITH	23 - 30
FN MOWDAWALLA	31 - 34
K ASTON	35 - 42
SP CHAKRAVARTI	44 - 47
MS THACKER	47 - 49
CS GHOSH	49 - 58
HN RAMACHANDRA RAO	58 - 69
BN NARAYANA IYENGAR	69 - 72
JOSEPH VITHAYATHIL	72 - 76
KS PRABHU	76 - 79
DP SEN GUPTA	79 - 83
MAL THATHACHAR	83 -

FACULTY 12

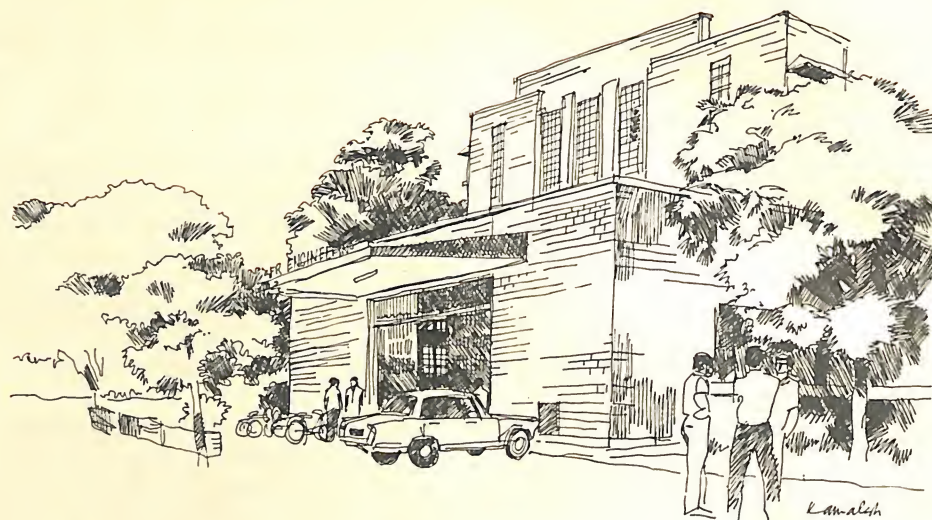
STUDENTS

Research	21
M E	26
Integrated M E	16
B E	64

STAFF 34

PUBLICATIONS 79 - 84 116

U G C Special Assistance



ELECTRICAL ENGINEERING

Electrical power generation, transmission, distribution and control are vital to the industrial and economic development of a nation. Indeed, such was the vision of the Founder, and the department of Electrical Technology was among the first two to be set up at the Institute. The main areas of current research of the Department of Electrical Engineering as it is now known, are power systems, power electronics, systems science, active and digital filters, image processing and bio-engineering.

Power Systems :

Significant contributions have been made to the development of the power sector in the country. Some of the recent studies undertaken include the design of 400 kV power transmission systems of the National Thermal Power Corporation, distribution system planning for Delhi Electric Supply Undertaking, Bharat Coking Coal Ltd., etc. as well as

planning and design of transmission and distribution networks of Afghanistan. A comprehensive software package for analysing the performance of high speed protective devices has been developed. Computer and microprocessor-based protection for transformers, transmission lines and induction motors has been a major activity.

A sophisticated computer-controlled interconnected generator system is being set up supported by the Indo-British Universities Collaboration Scheme. Problems of rural electrification, utilization of microhydel units and energy conservation in industries are being studied.

Power Electronics :

Major projects undertaken include (a) development of a prototype thyristor controller for a cold strip reversing rolling mill drive (b) development of prototype controllers for different categories of industrial

power drives, and (c) a scaled down model of a 4-phase chopper at a power level of 23 kW for railway applications. A chopper fed static inverter was developed for a battery - powered mobile X - ray unit intended for rural areas.

Systems Science :

Linear, nonlinear and adaptive systems have been extensively studied and criteria for stability, sensitivity and controllability have been established. Stochastic automata operating in unknown random environments have been successfully used in modelling learning systems. These learning automata have been shown to play a promising role in the routing problem in communication networks, in queuing systems and also in pattern recognition.

Filters :

Design and evolution of high performance, high order RC active and digital filters have been pursued. Filters with stringent technical and environmental restrictions have been developed, for the first time in the country, for defence applications.

Remote Sensing :

Remote sensing surveys have been conducted to establish an operational capability for the inventory-

ing and monitoring of natural resources like agricultural crops. Selected frames of colour infrared imaging have been subjected to automatic processing like thresholding, pseudocolour enhancement and thematic mapping.

Bioengineering :

A variety of biosignals such as Electrocardiograms (ECG), Vector Cardiograms (VCG), Electromyograms (EMG) and Electro Encephalograms (EEG) have been studied by digital signal processing, pattern recognition and time-series analysis techniques. Software packages have been made for morphological analysis and clinical diagnosis of heart diseases. Medical electronic instruments like car diac disaster alarm, multichannel auditory simulator, visual response indicator and ECG simulator have been developed.

Facility :

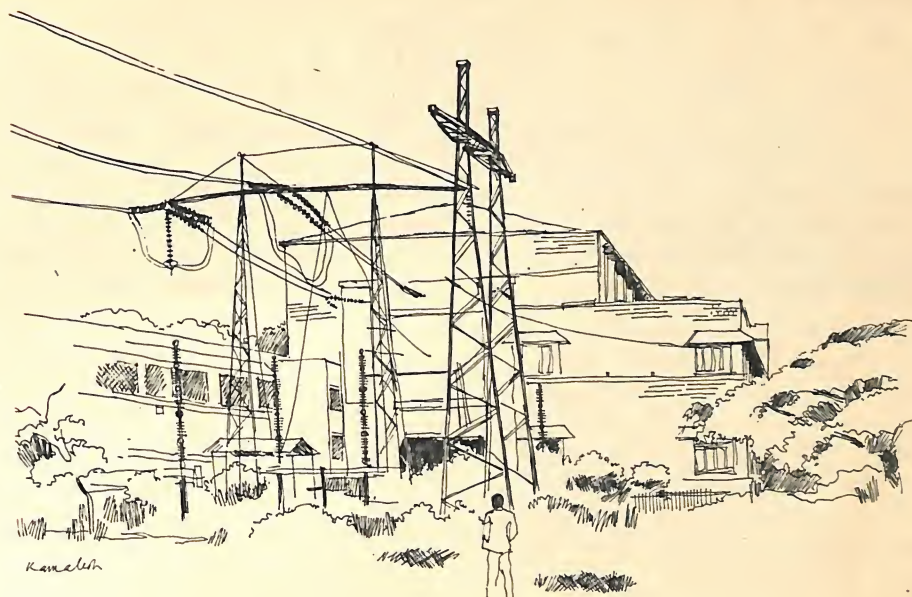
Interactive Digital Image Processing System centred on a Hewlett - Packard minicomputer for processing remotely sensed aerial/satellite multispectral data has facilities for a quick display of raw and processed data on a colour monitor, and for generation of output photoproducts on a LED drum scanner.



A Campus Vignette

High Voltage Engineering





ESTD : 1951

CHAIRMAN

GKM PFESTROF	51 - 54
DJ BADKAS	54 - 65
HV GOPALAKRISHNA	65 - 73
RSN RAU	73 - 75
GR GOVINDA RAJU	75 - 80
V PRABHASHANKER	80 - 83
BI GURURAJ	83 -

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HIGH VOLTAGE ENGINEERING

Basic and applied research relating to high voltage phenomena and related teaching activities have been the main thrust areas since the inception. Valuable know how has been provided in the development and testing of power apparatus needed by the electrical industry since its beginning, aiding in rapid indigenization and saving of foreign exchange.

Extensive studies have been carried out to investigate the physical processes leading to electrical breakdown and predict breakdown voltages of commercially important gaseous insulants such as air, sulphurhexafluoride (SF_6) and SF_6 - N_2 mixtures. Investigations on ageing of transformer oils due to thermal and electrical stresses have resulted in a better understanding of the phenomena and led to

the identification of newer test parameters for assessing the quality of the oils. Statistical models have been proposed to explain ageing of insulation in terms of physical processes and predict the partial discharge behaviour of solid-gas-liquid insulation systems. Insulation characteristics of high vacuum and arc phenomena in vacuum at currents upto 15 kA are being examined.

Analysis of surge phenomena in three phase transformers and rotating machines and impulse voltage dividers have received wide attention. Dynamic simulation of multiterminal high voltage d.c. systems, basic phenomenon in electrostatic precipitators, electrostatic separation of minerals and spray painting are under investigation.

Significant contribution has been made to the growth of the electrical industry in the country by offer of advice in the design, development and assistance in prototype and full scale testing of various types of power apparatus. Newer testing techniques and procedures such as impulse testing of transformers, switching impulse tests, radio interference and corona testing have been evolved. Assistance has been provided to many industries and educational institutions in the setting up of high voltage laboratories.

Facilities :

A few of the equipment are unique in the country :

3 MV, 50 kJ impulse voltage generator ;

200 kA, 30 kJ impulse current generator ;

3 × 350 kV, 1000 kVA transformers cascaded to give 1 MV and

250 kV, 25 mA direct voltage rectifier set and many other accessories and instruments.



INDUSTRIAL MANAGEMENT

ESTD : 1948

CHAIRMAN

SECTION OF ECONOMICS AND SOCIAL SCIENCES

NSR SASTRY 48-57

SECTION OF INDUSTRIAL ENGINEERING AND ADMINISTRATION

NSR SASTRY 55-57

R NATARAJAN 57-61

MC MUNSHI 61-64

A HAFEEZ 64-65

INDUSTRIAL MANAGEMENT

A RAMACHANDRAN 65-67

T GANGULY 68-82

N SOMASEKHARA 82-

FACULTY 9

STUDENTS

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STAFF 6

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Scientific and technological inputs can help in the creation of wealth only when capital, human and material resources are productively utilised. In addition to science and technology, management techniques are needed. The Department of Industrial Management studies management problems of relevance to the country and the industries.

Economics, Marketing and Finance :

The work on economic development policies and industrial estates was extended to the action oriented policies by the United Nations Industrial Development Organisation (UNIDO) for the developing countries. Contributions were made to the design of input-output systems for the evaluation of performance of the Indian public sector under the aegis of the Canadian International Development Research Centre (CIDRC). Econometric modelling of Indian development and evaluation of foreign collaboration in industry were achieved. Studies in the regulation of industrial wages, cost of capital and dividends in industry, shifting of corporate income tax and the financial structure of small companies were some of the other areas probed into yielding significant policy oriented conclusions.

Human Resources Management :

The work in psychology led to the development of a personality inventory, a battery of psychological tests and a neurotic inventory. Other studies in this field relate to issues in wage determination, social security programmes and two-factor theory of job satisfaction and productivity. An integrated approach to the complex inter-relationships of various factors influencing organisational behaviour has been proposed.

Ergonomics :

A psychometric chamber has been designed and set up. An ergonomics laboratory to carry out experiments in human work under different thermal conditions, work loads and noise levels has been developed. Energy expenditure as related to thermal and

work loads have been studied. Studies on hearing loss due to industrial noise have been undertaken.

Production/Operations Management :

Inventory control techniques of manufacturing organisations have been applied to cash management in banking. Sampling procedure for inventory valuation has been investigated using computer simulation. Production manpower profiles have been developed and related to environments. Heuristic models of manpower allocation and simulation studies of reserve manpower using reject allowance concepts have been designed. Method of potentials has been proposed as an alternative to PERT.

S & T and R & D Management :

Pricing of consultancy in technology transfers, selection of R & D projects and energy analysis and management have been looked into. Methodologies have been devised for estimating the level of demand for 'foot and mouth vaccine' in collaboration with the Indian Veterinary Research Institute. Technology transfer from the R & D laboratories in India to industries from the donor's point of view has been examined in the framework of the Israeli Bar-Zakay model.

Energy Management :

Participated and collaborated in the international study on the Asian Energy Problems sponsored by the Asian Development Bank. Contributions were also made to the formulation of an Energy Master Plan for Thailand upto 2000 AD and this was done under a project of the United Nations Development Programme (UNDP).

Systems management orientation and management science approaches, particularly in the areas of management of science and technology and research and development, energy and its analysis and environmental management are envisaged as thrust areas for the future.

ESTD : 1945

CHAIRMAN

INTERNAL COMBUSTION ENGINEERING

BC CARTER	45-52
HA HAVEMANN	52-57
MRK RAO	60-67
AV SRINATH	68-74

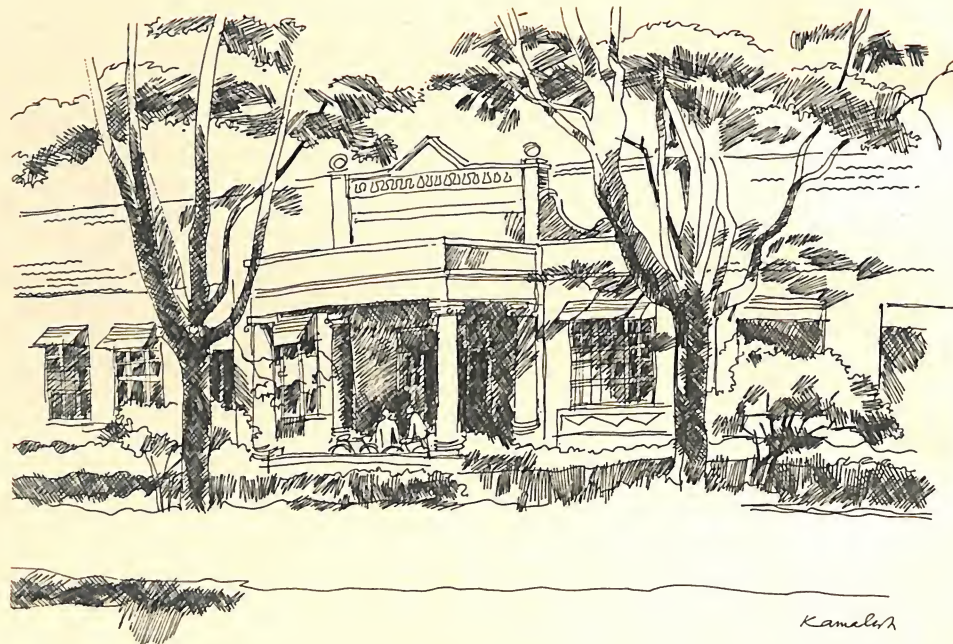
POWER ENGINEERING

CH KENT	47-54
A RAMACHANDRAN	57-67
MA TIRUNARAYANAN	68-74

MECHANICAL ENGINEERING

LS SRINATH	74-77
S SOUNDARANAYAGAM	77-83
K NARAYANASWAMY	83-

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M E	52
Integrated M E	17
STAFF	108
PUBLICATIONS 79 - 84	220



MECHANICAL ENGINEERING

Research in Mechanical Engineering covers a wide spectrum of activities. The broad areas are thermal systems, engines, turbomachines, melting and casting, and machine design.

Mechanical Systems Analysis and Design :

Pioneering work was carried out during the last decade on optical methods of stress analysis which have now been accepted as standard practice. Stu-

dies have been in progress on low cycle, high strain, bending fatigue and fracture mechanics. Computerised methods have been developed for the synthesis of mechanisms and analysis of kinematic chains. Fundamental aspects of wear in metals and alloys, thermal field profiles during forging, dynamics of vehicle systems, performance aspects of bullock carts and wide band vibration absorbers have been investigated.

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Thermal Systems and Thermodynamics :

Recent studies relate to boiling heat transfer, two phase flows, numerical computation of conduction heat transfer, heat pipes, flow induced vibration of heat exchangers, Second Law analysis of heat exchanger performance; Rankine cycle power system in conjunction with a solar pond; improving the ignition characteristics of Indian coals; low temperature pyrolysis of coal dust to obtain data on the quantity and nature of gaseous fuels evolved. A new line of study has been taken up on lasers and their application to welding, drilling and melting metals.

Early studies of free and forced convection in ducts of various forms aided in establishing the 'Shape factor' to characterize the pressure drop and heat transfer rates. A high accuracy oscillating disc viscometer was built for determination of the viscosity of ternary gas mixtures.

Turbomachines & I. C. Engineering :

Ethyl alcohol as a primary fuel in diesel engines was investigated for the first time anywhere. This early work showed that high power output and thermal efficiency on the one hand and low exhaust smoke density could be obtained, long before the energy crisis was recognised. Studies related to combustion in engines and in high speed flow have been carried out: a cyclone combustor and an injection system for pulverised coal; hydro-dynamics of lubrication and wear in engines; noise suppression in engines and turbojets. Development work on the air intakes of the HF-24 (Marut), the first indigenous design of supersonic aircraft, was carried out here.

Recent studies relate to use of emulsified fuel in diesel engines to improve combustion, modelling

engine processes and predicting engine performance, total energy system based on a single cylinder diesel.

Aerodynamics of flow through axial and mixed impellers; cascade mechanics, boundary layers in stationary and rotating cascades, transition problems, supersonic cascades, cavitation in hydraulic turbomachines and marine propellers.

The multidisciplinary approach to problem identification and novel solutions has led to the application of SG Iron for crankshafts and aluminium-graphite composites for cylinder liner, pistons and bearings among others.

Foundry Science :

Fundamental studies in this virgin field with immense applications potential is related to the structure-property correlations in cast, ferrous and non-ferrous systems and in depth examination of their casting characteristics. Development of high duty flake, malleable, SG and compacted graphite irons in the Indian context has aided in upgradation of technology in the foundries. Gating and feeding, forging and welding of SG Iron, corrosion resistance of cast nickel free stainless steels and austenetic SG Irons, properties of mould materials are covered. This group has paved the way for scientific approaches in the field of melting and casting in India.

Facilities :

Mach-Zehnder and Holographic Interferometers, Oscillating Disc Viscometer for gases (0.1 % accuracy), 5-tonne low cycle direct-stress fatigue machine, Cascade Wind Tunnel, Rotary Cascade Tunnel, experimental axial compressor have been developed here.

ESTD : 1945

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F ADCOCK	45 - 48
BRAHM PRAKASH	51 - 57
AA KRISHNAN	57 - 72
KP ABRAHAM	72 - 77
RM MALLYA	77 - 81
S RANGANATHAN	81 -

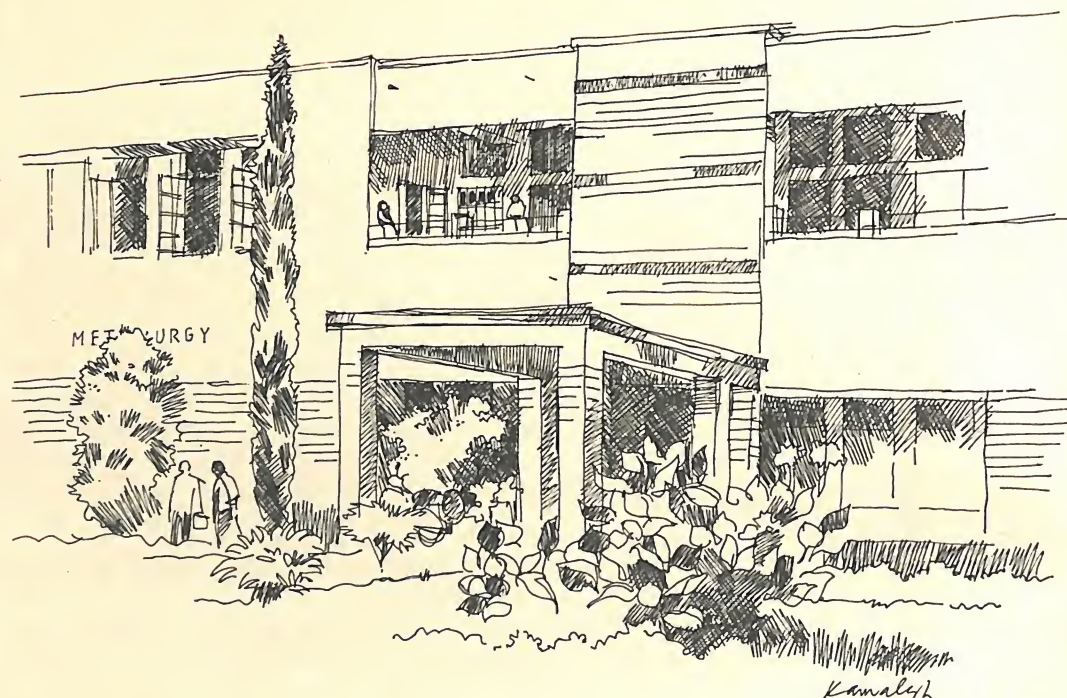
FACULTY 19

STUDENTS
 Research 50
 M E 17
 B E 27

STAFF 30

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U G C Spl Assistance



METALLURGY

Metallurgy is concerned with the extraction of metals from their ores and their conversion into alloys in useful shapes with desired properties to satisfy the demanding applications of present day technology. The research interests of the Department cover this entire spectrum with emphasis on the scientific principles underpinning various ways of metal processing. In India it pioneered metallurgical research in an educational institution as early as the late forties. Indeed the work carried out at that time was of crucial

importance to the then nascent national atomic energy programme.

Mineral Processing :

Research work in the area of mineral processing has been given a new thrust to include fine particles processing, selective flocculation of ore fines, beneficiation of scheelite, wolframite and phosphates, environmental aspects of mining and mineral processing. A

IISc 1909-1984

special research project on the tribology of ore grinding has recently been initiated.

A hydrometallurgy laboratory for electrochemical studies, bacterial leaching, agitation and percolation leaching as well as electrosulurry leaching has been started and an interdisciplinary project on bacterial leaching has been taken up.

Extractive Metallurgy :

The Department has had a long tradition of research in thermodynamic properties of solid and liquid alloys, oxides, sulphides and sulphates. The systems studied are either of direct interest to extractive metallurgy, ceramics and high temperature technology, or provide a base for the development of predictive models and semi-empirical correlations, used in computer calculation of complex thermal and chemical equilibria in high temperature reactors. Interplay between thermodynamic predictive models and structural characteristics of multicomponent phases is receiving increasing attention.

Mathematical modelling of Blast Furnace, Rotary Kiln and Inred processes are the identified areas where significant improvements can be achieved with Indian raw materials by novel modifications. Analysis of heat balance in flash smelting and copper converting processes have specified the minimum capacity of reactors for thermal self sufficiency, critical temperatures of operation and copper losses in slags. Development of new solid state sensors for continuous monitoring of high temperature process streams has led to new sensors for SO_x and H_2S .

Electroslag refining studies on steels, superalloys and aluminium alloys of interest in aerospace and defence applications have been completed. Current efforts are aimed at developing a liquid metal level indicator, moulds for continuous withdrawal and new slag compositions for casting.

Mechanical Metallurgy :

Ingot metallurgy as well as powder metallurgy paths for the processing of aluminium-lithium alloys are being evaluated. These alloys are expected to become a major material for components of future aircrafts. The development of micro-structural features as a function of process parameters during deformation processing has been studied. An exciting possibility of integrating the mechanistic and microstructural aspects

has emerged as a result of these studies. The subtle role that texture plays in deformation and its subsequent influence on properties has been elucidated in a variety of hexagonal close-packed alloys. An important observation relates texture to stress corrosion cracking in titanium alloys. A relatively new creep test called "Impression Creep" has been applied to zinc and cadmium at high temperatures.

Wear studies form an important facet of work. The effect of dispersoids such as graphite, mica and alumina in aluminium and its alloys has been studied. Wear in composite materials such as fibre reinforced plastics and jute-glass are attracting attention.

Physical Metallurgy :

The thermal stability of metallic glasses is being investigated for their suitability to replace silicon steels in transformer applications. Rapid solidification processing of aluminium alloys is under way. It has been possible to characterise the refinement of microstructure, extension of solid solution as well as formation of metastable phases. Laser surface processing as well as under cooling experiments have been carried out to map the details of the liquid to solid transformation.

Phase transformations are followed from thermodynamic, kinetic and microstructural points of view. Extensive work carried out on precipitation in aluminium alloys, particularly on influence of trace additions, has led to the development of a high strength Al - Zn - Mg alloy. Titanium alloys, where ordering and martensitic reactions occur, have been studied.

Oxidation of binary alloys such as Cu - Mn, Cu - Ni and Ni - Mn have been investigated to demonstrate the segregation of Mn on the surface. Corrosion of iron in salt solution has been studied to identify the products and establish the mechanism of corrosion.

Facilities :

Electroslag refining unit (350 kVA, DC, 20 cm ingots, 60 cm hollow casting), hot torsion and constant stress creep testing, impression creep, ion nitriding and a variety of rapid solidification devices have been designed and fabricated in the Department.

A dynamic Instron testing machine, Leco C/N analyzer, Cahn microbalances, Perkin-Elmer differential scanning calorimeter, Enraf-Nonius X-ray generator, Hydraulic Press (250 tons) and Mossbauer spectrometer are available for investigatory work.

ESTD : 1969

CHAIRMAN

IG SARMA	71 - 79
G KRISHNA	79 - 82
SV RANGASWAMY	82 - 84
SN RAO	84 -

FACULTY 23

STUDENTS

Research	58
M E	39
B E	72

STAFF 28

PUBLICATIONS 79-84 183

SCHOOL OF AUTOMATION

Automation is vital for industry and public utilities. The school is concerned with the thrust areas of Systems, Computers and Information sciences.

In the area of Computer Science, areas of current interest include Mathematics of Computation, Computer Science, Theoretical Computer Science, Information Systems, Computer Graphics, Computer Oriented Numerical Analysis, Parallel Algorithms, Data Base Management, Operating Systems, Language Processing and Language Theory.

Significant contributions have been made in the area of System Science, more specifically in Decentralized Control and Estimation of Large Systems, Simulation Methodologies, Game Theory, Algebraic Multivariable Systems, Reliability Theory, Fault Tolerant Control, Computer Control of Process Systems etc. Areas receiving attention in Information Processing Systems include Pattern Recognition including Cluster Analysis, Image Coding and

Edge Detection and Radar Signal processing.

Development :

Feasibility study and system design considerations for computer control of LD converter, Applications software packages and user training in hybrid computation, Simulation Evaluation of industrial control systems, Reliability modelling and computer-aided reliability analysis of large engineering systems with special reference to aerospace applications, Automatic speaker recognition, Speech analysis and synthesis, Airworthiness of aircraft, Drum scanner, Color scanner and micro-processor controlled Robot arm.

Facilities :

PDP-11/35-AD5 Hybrid Computer, Intel Microprocessor Development System, Texas Instruments Microcomputer, Scanning System with digital tape recorder.

ESTD : 1982

COLLABORATION :

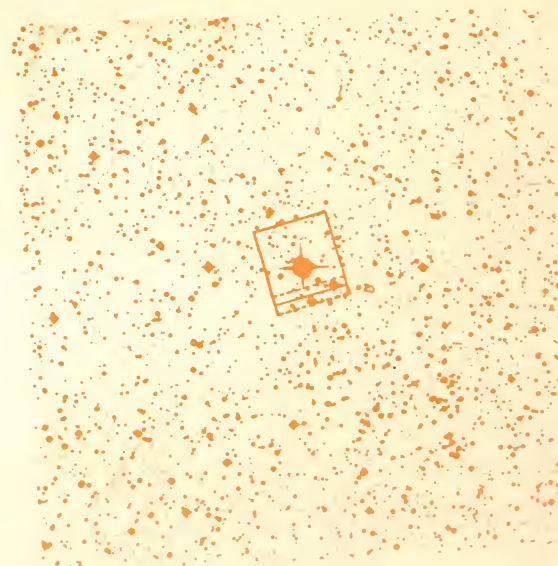
INDIAN INSTITUTE OF
ASTROPHYSICS,
BANGALORE

INDIAN SPACE RESEARCH
ORGANISATION,
BANGALORE

PHYSICAL RESEARCH
LABORATORY,
AHMEDABAD

RAMAN RESEARCH
INSTITUTE,
BANGALORE

TATA INSTITUTE OF
FUNDAMENTAL RESEARCH,
BOMBAY.



ASTRONOMY AND ASTROPHYSICS PROGRAMME

A revolution in astronomy is in the horizon. With new wavelength - windows opening up, one is able to look at the remotest corners of the universe - into the very distant past. In many ways the excitement in astronomy today can be compared with the excitement in physics at the turn of the century, and in biology not so long ago. Fortunately, India is not lagging behind and is participating in many of the new frontiers in astronomy and astrophysics identified a "thrust area" by the Government.

Five selected students after intensive courses over a year embark on a research project in the Indian Institute of Science or in one of the collaborating institutions.

Research interests are : Astronomy and cosmology

astronomical techniques, astrophysical plasmas, Stellar Physics, interstellar medium, high energy Physics and General Relativity. Interactions are envisaged with several IISc research activities - Instrumentation, development of detectors, signal processing, antenna engineering and cryogenics.

A unique advantage of this programme is that the researcher has access to a truly impressive array of major astronomical instruments, such as telescopes in the optical, millimeter and radio wavelengths and observational facilities in infrared, X-ray and γ -ray frequencies. Acquisition of a 16" optical telescope and a radio interferometer for instructional purposes have also been planned.

CELL FOR APPLICATION OF SCIENCE AND TECHNOLOGY TO RURAL AREAS (ASTRA)

To catalyse the development and testing of village-oriented technologies at the Institute and establish an Extension Centre amidst a cluster of villages near Bangalore to transfer the technologies to rural areas are the primary objectives of ASTRA.

The Extension Centre was set up in 1976 at Ungra village, after a survey of 25 villages, on a 55 acre plot of land leased by the Karnataka Government. This is located 110 km from Bangalore in Kunigal taluk, Tumkur District.

Biogas plants, windmills, bullockcarts, energy consumption patterns in villages, rural ecosystems, low cost building technologies, and solar Energy for sericulture industry have been investigated. A special edition 'Rural Technology' by the Indian Academy of Sciences summarises the results.

A wood buring stove with an impressive efficiency of 35 to 45 % has been designed and fabricated. Made of mud, termed 'ASTRA OLE', it is gaining popularity in the villages of Karnataka. To enable dissemination, the Karnataka Government has launched a programme of training village artisans.

A new machine for pressed soil blocks called

ASTRAM was designed, fabricated and field tested. About 20 demonstration buildings have been constructed in Karnataka using this technology.

For processing Sisal fibre, several new machines have been designed and fabricated. A raspador machine for extracting fibre from Sisal leaves is currently in operation at the Ungra Extension Centre. Machines for fibre combing and rope making are in the final stages of fabrication.

Simple methods of burning rice husk have been found to produce highly reactive silica. Laboratory trials have shown high promise in producing a good quality cement based on lime, surkhi and rice husk ash.

A woodgas reactor has been successfully designed and fabricated to operate on woodchips. The gas from the reactor can be used to run diesel engine on dual fuel basis (80 % wood gas and 20 % diesel).

ASTRA has been active with its many pronged approach to technologies for rural areas : construction of community bio-gas plants, pressed soil cement blocks, demonstration building based on the low cost technology, improved lime kiln, Jaggery stove and rural training programmes.

ESTD : 1974

CONVENER

AKN REDDY

74-83

KS JAGADISH

83-

STAFF

10

ESTD : 1971

CHAIRMAN

M SIRSI	71 - 73
NR MOUDGAL	74 - 75
YI SHETHNA	75 - 76
G RAMANANDA RAO	76 - 77
G PADMANABHAN	77 - 78
KP GOPINATHAN	78 - 80
TM JACOB	80 - 81
VN VASANTHARAJAN	81 - 82
PR ADIGA	82 -

FACULTY	1
STAFF	10



CENTRAL ANIMAL FACILITY

This facility (CAF) provides experimental animals for bioassay, drug testing, evaluation of nutritional values of feed, reproductive physiology and cell genetics. In addition to breeding of animals under controlled conditions, it has facilities for quarantine and surgery. Presently there are 3500 rats, 1500 mice, 500 hamsters, 100 rabbits and 50 guinea pigs and has a breeding capacity to produce and supply 20 to 25,000 animals of different species and strains per year.

The primate facility at the Centre is one of the best of

its kind available in this part of the world for investigations on various facets of primate reproductive biology.

Personnel of the facility have assisted in setting up animal facilities at other institutions in the country and drawing up national standards for laboratory animals handling and have offered training facilities to academics from other institutions in the breeding, maintenance and management of animals.

ESTD : 1971

CONVENER

ES RAJAGOPAL	71 - 72
R SRINIVASAN	73 - 84
PS NARAYANAN	84 -

FACULTY	4
STAFF	3

CENTRAL CRYOGENIC FACILITY

The Institute has recognised, from its inception, the important role that cryogenics plays in its research programmes. The tradition of low temperature investigations at the Institute, dates back to many decades.

The Central Cryogenic Facility was established to streamline the production and supply of cryogenic fluids. The present facility has two Philips liquid nitrogen plants and one liquid helium plant. Over 1,20,000 Litres of liquid nitrogen and 11,000 litres of liquid helium are produced in a year. The facility

supports the functioning of several critical facilities in the Institute such as FT-NMR, ESCA, EDAX etc.

Cryogenic development projects are an integral part of the activity of the facility. Indigenous development of superinsulated cryogenic containers and tanks have been carried out. Development studies are planned in the area of cryocoolers, helium phase separators and cryobiological applications.

To meet the evergrowing need for the cryogens, addition of a liquid nitrogen plant and a liquid helium plant is planned for the near future.



CENTRE FOR ATMOSPHERIC SCIENCES

Basic dynamics of the Monsoons, Atmospheric boundary layer, Numerical and stochastic models, Geophysical fluid dynamics and Radiation in atmosphere are some of the major areas of interest of the Centre for Atmospheric Sciences.

Considerable work has been done on the climatology and dynamics of the monsoon. The first objective climatic classification of the Indian region has been derived, and a prominent mode of the intra-seasonal variation of the monsoon has been discovered. Coupling between the Indian Ocean and the monsoonal atmosphere has been investigated and the relationship between the variability of the monsoon and that of the oceanic conditions described.

Theoretical models have been developed for various phenomena in rotating stratified fluids such as jets, blocking phenomena, mountain waves, current-topography interactions etc. The effect of heat sources on the planetary scale monsoon has been studied with the help of simple linear models.

Stochastic analysis of rainfall data has been undertaken for modelling and prediction. Significant auto-correlations are found for weekly time series. Analysis of point and district annual rainfall data of Karnataka including return period estimation has been completed.

Propagation of radiation in the atmosphere is studied to examine the extinction suffered by radiation and to use the radiation scattered by laser beams

for diagnostic purposes. Numerical computation of the spectral radiance of the earth's atmosphere for a tropical standard atmosphere has been carried out. Models have been developed for deriving conditions at the earth's surface from satellite observed radiances.

A facility has been set up for special observations of the atmospheric boundary layers. The results of two observational experiments carried out so far have been analysed. The effects of the solar eclipse on the boundary layer have been investigated and the important time-scale of its response identified. A simple model for this phenomenon has been developed to offer a consistent physical explanation of all the observations.

An Indian Standard Tropical Atmosphere has been proposed for adequately describing the mean conditions from 0° to about 30° N, valid from mean sea level to 80 km.

An advanced system for measuring velocity, temperature and humidity in the atmospheric surface layer and a computer data acquisition system have been developed. These have been utilized in two field experiments to enable direct measurement of eddy fluxes.

A laser monitoring system for remote measurement of species concentrations and temperatures using Laser Raman and velocities using Laser Doppler Anemometry in the atmosphere is under development.

ESTD : 1982

CONVENER

R NARASIMHA

82 -

STAFF

4

ESTD : 1975

CHAIRMAN

LS SRINATH 75-84
NS LAKSHMANA RAO 84-

FACULTY 7
STAFF 13

QUALITY, FACULTY IMPROVEMENT

Ph D 110
M E 44
PROGRAMMES 80
PARTICIPANTS 1200

EXTENSION COURSES

PROGRAMMES 100
PARTICIPANTS 2500

HIGH SCHOOL SCIENCE TEACHERS PROGRAMMES

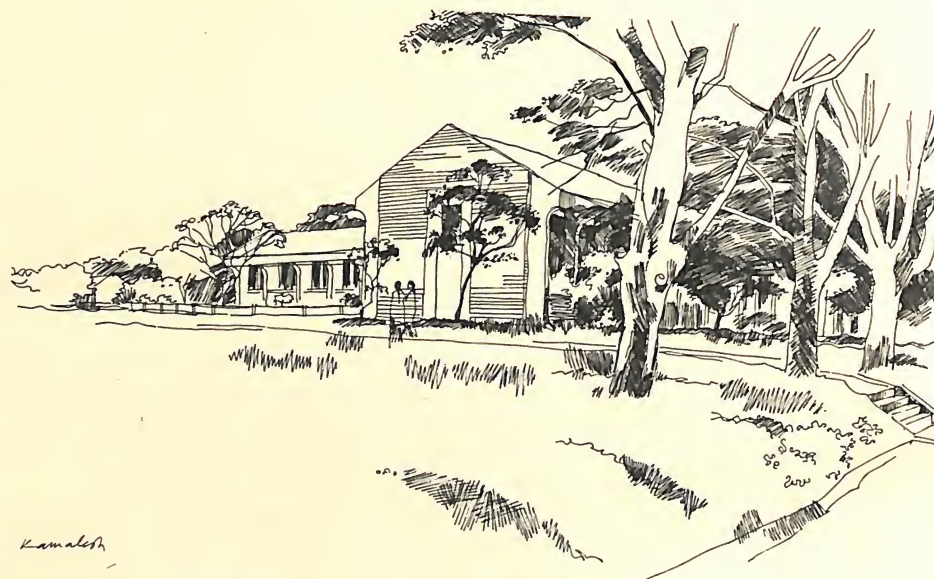
PROGRAMMES 11
PARTICIPANTS 1200

PROFICIENCE

PROGRAMMES 186
PARTICIPANTS 8300

CURRICULUM DEVELOPMENT CELL

BOOK WRITING 49



CENTRE FOR CONTINUING EDUCATION

It has initiated several programmes which take into its fold a wide spectrum of people and activities. Some of these activities are : The Quality Improvement Programmes for Engineering College teachers, Extension Courses for working engineers and scientists, High School Science teachers programme, Mathematics Olympiad and Intensive Courses to meet specific needs.

'PROFICIENCE' is an unique innovative evening programme for personnel employed in scientific and industrial establishments, organised in collaboration with fifteen national professional societies to

provide teaching coupled with laboratory work.

The Centre provides assistance for book writing and for preparation of audio-visual aids for teaching, under the Curriculum Development Cell. Modernisation and updating of the school curricula for science and mathematics, in Karnataka has been accomplished.

Facilities :

Stand alone computers (3) and word processor.
Residential accommodation for participating faculty.

IISc 1909-1984



CENTRE FOR ECOLOGICAL SCIENCES

With growing awareness of the relevance of ecology, the Indian Institute of Science decided to strengthen activities in this field. The Department of Environment, Government of India, responded with support for the establishment of a Centre for Ecological Sciences as the first among the Centres of Excellence. Comprising of life scientists, chemists, mathematicians and engineers, the emphasis is on field-oriented research work. The Uttara Kannada District of Karnataka in the Western Ghats has been chosen, as the initial focus of its activities and an extension centre at Sirsi has been set up to undertake ecodevelopment activities.

The research programme concerns itself with four major scientific queries: (1) How are biological communities organized? What determines the number and identity of species occurring in

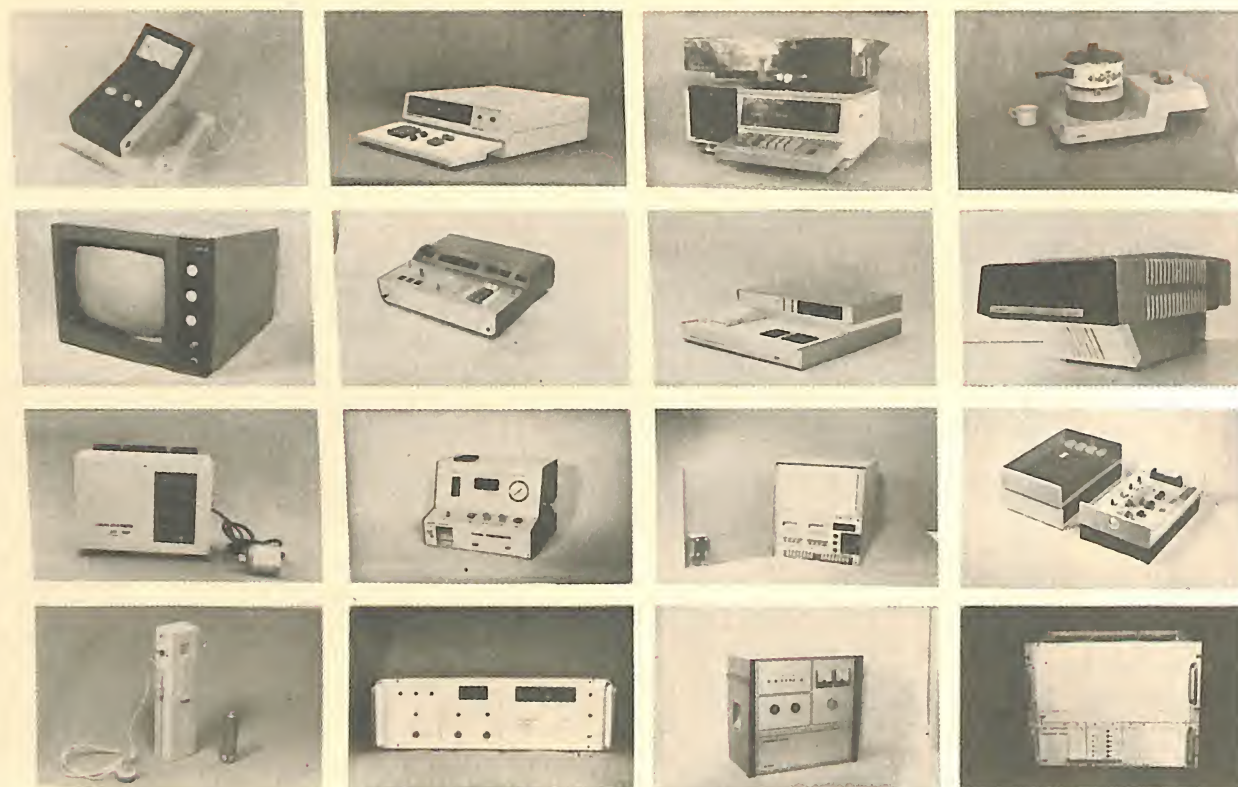
any community? What is the impact of various forms of land use on levels of biological diversity? How best can we preserve our heritage of biological diversity? (2) What favours the evolution of sociality in certain groups of animals? What role do the social animals—ranging from ants to elephants—play in biological communities? (3) What role does the dominant social animal, man, play in biological communities? How do his activities, both traditional and modern, affect the productivity and diversity of biological communities? (4) How can man improve his management of biological communities? In particular, how can he revegetate the degraded hill tracts of Western Ghats with plant species yielding fuel, fodder, and other useful products? How can he improve the efficiency of the use of fuel, fodder, construction material and so on to reduce his demands for these materials?

ESTD : 1982

CONVENER

MADHAV GADGIL

82 -



ESTD : 1975

CHAIRMAN

BS SONDE 75 - 81

NJ RAO 81 -

FACULTY 13

STUDENTS 20
Diploma

STAFF 28

PUBLICATIONS 79 - 84 18

CENTRE FOR ELECTRONICS DESIGN AND TECHNOLOGY

This Centre carries out development and research in the design and fabrication of electronic and electromechanical systems and imparts training in electronics design and technology. It started with the support from the Swiss Development Co-operation and the Department of Electronics.

Training is imparted in all aspects of electronic product development including industrial and thermal design and fabrication techniques. Centre has built up facilities for making PCB's and prototypes of

products. Eventual productionisation of products developed by the Centre is encouraged. Special interest of CEDT lies in the areas of power electronics, electromechanics, industrial instrumentation and microprocessor systems.

Some of the important products currently being productionised include Electronic Load Frequency Controller, Conveyor Speed Monitor, Power Electronics Experimental Modules, Hearing Aids and Microprocessor Trainer.

ESTD : 1982

CONVENER

NJ RAO

82 - 84

N BALAKRISHNAN

84 -

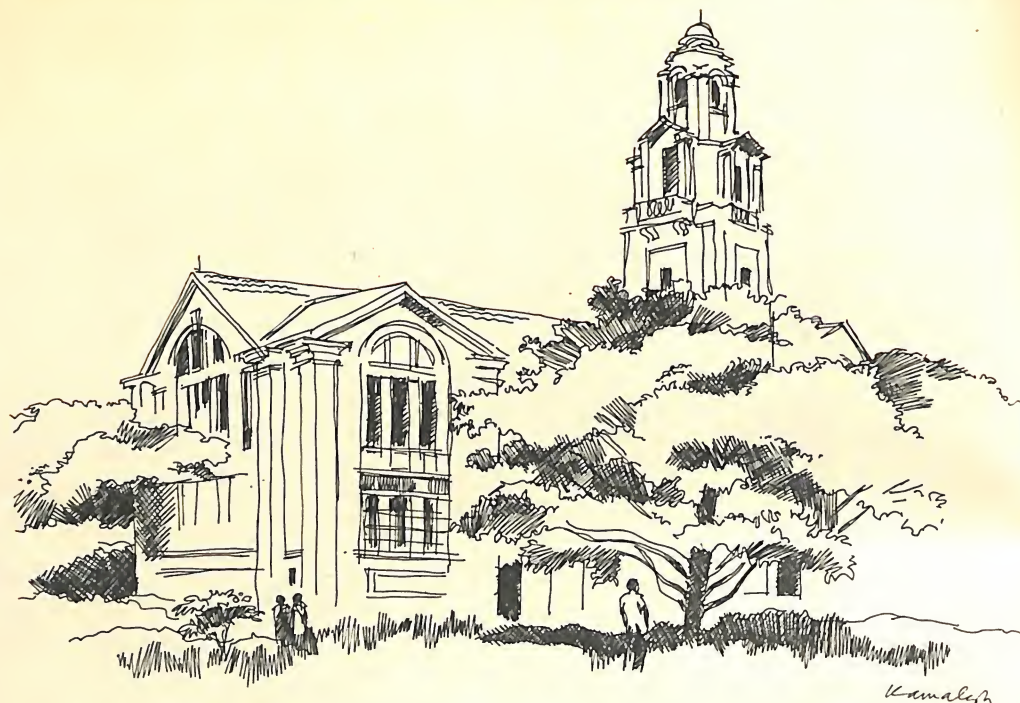
STAFF

3

CENTRE FOR MICROPROCESSOR APPLICATIONS

Recognizing the key role of microprocessors, a number of Departments at the Institute initiated several years ago developmental work on microprocessor based systems. The Centre offers comprehensive instructional and developmental facilities at one place, to the students and staff of the Institute and also trains teachers and practicing engineers from other Institutions in microprocessors.

The Centre has procured Microcomputer Development Systems and other tools to provide comprehensive infrastructural support for all microprocessor based design activities. The Centre is involved in the design and development of microprocessor based hardware and software modules with a view to establish standards.



UNIVERSITIES CENTRE FOR SCIENCE INFORMATION

CHAIRMAN

V RAJARAMAN

83 -

FACULTY
STAFF

1

9

Literature search is a very important component of any research and development activity. Quantification in terms of cost and time involved in literature search is difficult to make. The cumulated time is, however, quite enormous. Automated current awareness services are therefore being increasingly used in many countries to alert their S & T workers about work being carried out elsewhere.

The main objectives of the Centre are :

1. To create current awareness, among scientists working in Indian Universities, of research work being carried out in other countries, related to their field of research.

2. To educate the users in generating queries for their needs in realisation and optimal utilisation of the information services.

The Centre has started its services in the fields of Physics and related areas of Electrical Engineering, Electronics, Computer & Control and Information Technology. Current awareness is planned to be extended soon to other areas in science including Biology, Mathematics, Earth Sciences and Chemistry. A training programme is offered in Library Automation and Information Retrieval for Library/Information professionals.



CENTRE FOR SCIENTIFIC AND INDUSTRIAL CONSULTANCY

'Research work to promote material and industrial welfare of India' is the founding principle of the Institute. Linking academic work of the Institute with development and problem solving in real-life and promoting interactions between the academia on the one hand and the industrialists, entrepreneurs and applied scientists on the other have gone on ever since the inception of the Institute. This Centre came into being as a culmination of the sustained efforts to promote this ideology. The Consultancy Centre catalyses and nurtures *applied research* of relevance to industries and *testing and evaluation* of engineering systems and devices of a specialised nature.

Transfer of technology, design, development and fabrication of products and processes, systems design in a wide range of scientific disciplines, advise in setting up inhouse R & D laboratories, model in-

vestigations in the laboratory of complex engineering systems, software development, workshops, seminars and intensive courses tailor made to the needs of industrial groups, constitute the project range - over 100 handled every year involving more than 150 faculty and many scientific and technical personnel. Multidisciplinary groups tackling challenging tasks, often of national relevance, aids in generating new knowledge and first hand experience of field problems providing an interesting exposure to students also.

The Centre has strived to disseminate research results to the wider community through newsletters, brochures and audio visual aids including documentary films. Vichara, the Institute lecture series by eminent men of science and letters is aimed at widening the horizons of industrial experience.

ESTD : 1975

CHAIRMAN

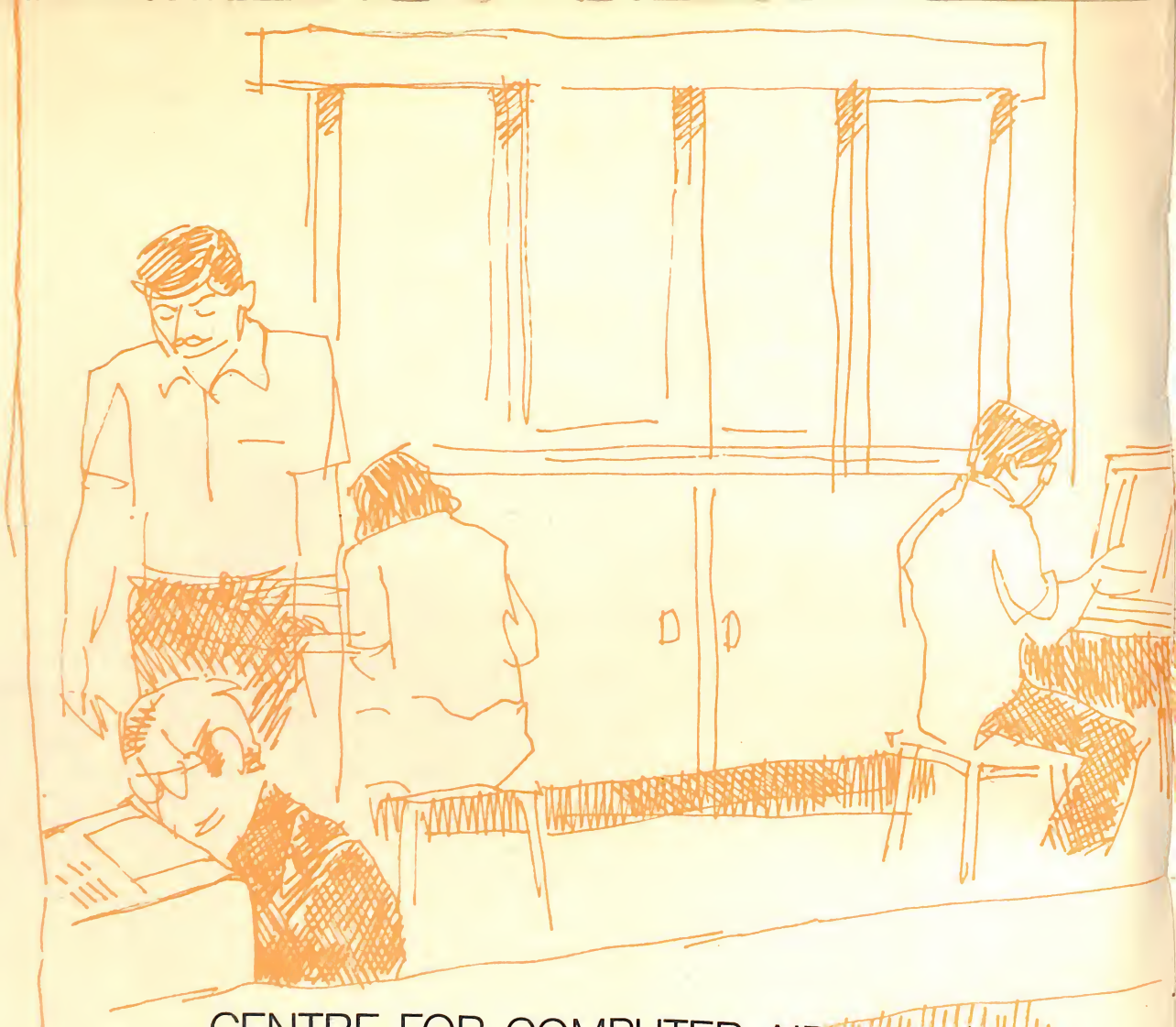
HV GOPALAKRISHNA 75-77
MN SRINIVASAN 77-

FACULTY 5
STAFF 10

VICHARA

The Institute Lectures

Avtar Singh Paintal	— "Past & Present Approaches to Scientific Research"
S Chandrasekhar	— "Why are the Stars as they are?"
BN Goswamy	— "Landscape in Indian Art"
Raghavan N Iyer	— "Enlightenment and Revolution : The Post Modern World"



CENTRE FOR COMPUTER AIDED DESIGN

ESTD : 1984

CONVENER

V RAJARAMAN

84 -

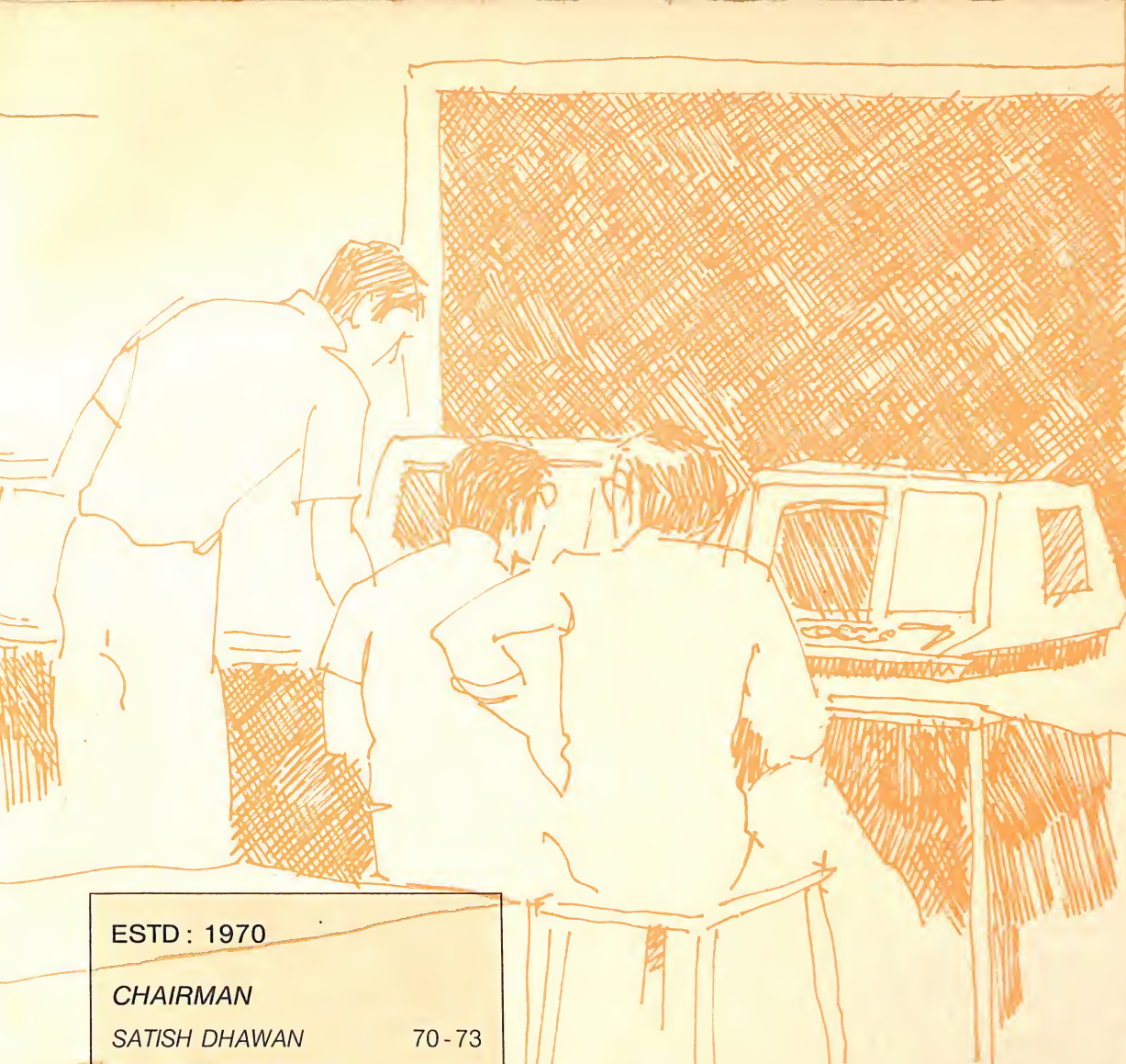
The Government of India in co-operation with the United Nations Industrial Development Organisation (UNIDO) is setting up a number of centres for Computer Aided Design (CAD), an important emerging area of technology, in the country. The Indian Institute of Science, Bangalore, has been identified as one of the centres. As Bangalore has a strong industrial base in electronics, this Centre has been given the responsibility for CAD of Electronic Systems.

The main goals of the centre are to carryout

research and software development oriented towards the use of computer aids as an integral part of the design process, build a good library of software programs by inhouse development and acquisition from other centres in the world, develop educational materials and packaged programmes for regular and short term training of engineers and develop Computer Aided Learning (CAL) packages.

This facility would be available for use by electronic and allied industries.

IISc 1909-1984



COMPUTER CENTRE

ESTD : 1970

CHAIRMAN

SATISH DHAWAN	70 - 73
EV KRISHNAMURTHY	73 - 74
NN BISWAS	74 - 76
ALI AKBAR SHAMIM	76 - 80
S RAMASESHAN	80 - 82
V RAJARAMAN	82 -

FACULTY	11
STAFF	16
PUBLICATIONS 79 - 84	29

The Computer Centre has a Dec - 1090 system with the following configuration : KL - 10 CPU, 512 KW Memory, 800 MB of On Line Storage, 3 Magnetic Tape Units, 2 Card Readers, 2 Line Printers, 32 Asynchronous Lines and a CALCOMP Drum Plotter.

DEC 1090 is a multiprogrammed and multiaccess system which can be used in batch processing and interactive modes. The system supports a variety of utilities and software in the areas of database management, simulation, numerical analysis and graphics. Among the programming languages available on this computer are ALGOL, APL, BASIC, BLISS, COBOL, FORTRAN, LISP, PASCAL, SNOBOL.

The Centre assists computer users in developing, designing and debugging computer programs and participates in the academic programmes of the Institute in the areas of computer science. The Centre conducts courses for both advanced users and beginners under the User Education Program. Regular training programmes are conducted on computer operations, systems and application programming.

The facilities of this Centre have been made available to other educational institutions, research and development organisations and industrial establishments in Bangalore.

ESTD : 1964

CHAIRMAN

CENTRAL INSTRUMENTS AND SERVICES LABORATORY

KJ HABELL	63-65
S DHAWAN	66-71
M RAMAKRISHNA RAO	71-78
SLV CHARY	79-80
S RAMAKRISHNA	80
AK RAO	80-82
ES RAJA GOPAL	82-83

REGIONAL INSTRUMENTATION CENTRE

M RAMAKRISHNA RAO	79-82
ES RAJA GOPAL	82-83

INSTRUMENTATION AND SERVICES UNIT

ES RAJA GOPAL	83 -
	(CISL & RIC)
	83 -
	(RIC)

FACULTY	16
STUDENTS	
Research	1
Diploma	3
STAFF	48
PUBLICATIONS 79-84	56

INSTRUMENTATION AND SERVICES UNIT

Experimental research requires sensitive and reliable instrumentation. The intricacies and complexities of instruments have increased with concurrent developments in the wide array of scientific disciplines.

ISU has the triple function of (1) research, design, development, fabrication and training in instrumentation (2) offer of valuable services of specialist analytical research tools, located here and (3) repair and maintenance of instruments. This is made available as a central facility to the scholars of the Institute.

Design and development of vacuum systems and associated instrumentation led to the establishment of high vacuum industry in the country. The investigations carried out on the development of vacuum coating have triggered activity in thin film devices technology. Valuable contributions have been made in the development of lasers, electronic

instruments, precision optical components, holography, interferometers and solar energy instrumentation.

The Regional Instrumentation Centre

This Centre for the Southern region in India, in addition to carrying out research and development in specific aspects of Instrumentation offers training to personnel in various University Service and Instrumentation Centres (USICs) in the Country.

Facilities :

Infrared, visible and ultraviolet recording Spectrophotometers, Mass Spectrometers equipped with spark, thermal ionization and electron bombardment ion sources for gas analysis. A Radio Chemistry Laboratory with isotope standards, counters and associated electronic equipment, the NMR Spectrometer, Mossbauer Spectrometer and Computer controlled Single Crystal Diffractometer.



IISc — ISRO SPACE TECHNOLOGY CELL

ESTD : 1982

CONVENER

SK SRIVASTAVA

83 -

STAFF

3

During the last 25 years the world has witnessed extraordinary developments in space technology. In a short time India has achieved remarkable success in its modest endeavour in this field.

The Cell established in 1982 with support from ISRO and IISc draws upon the research base and expertise available in ISRO and IISc and promotes research in areas of relevance to the future technological needs of the Indian Space programme.

Projects sponsored by the Cell so far include: Liquid-engine combustion instability; Slosh studies; Studies in orbital mechanics; Control-structure interactions in large flexible spacecraft;

Experimental study of liquid mixture behaviour under simulated micro-G conditions; Catalytic decomposition of monopropellants; Computation schemes for three-dimensional turbulent boundary layers; Computer classification of remotely sensed data; Thermal expansion studies of cryogenic materials at low temperatures; Heat transfer measurements in shock tunnel at large incidence; Fiber optic broadcast system; Token broadcasting structure for communication between data flow computers.

The Cell also supports technical publications, visiting scientists, and organisation of symposia and technical workshops.



ESTD : 1983

CONVENER

HS MUKUNDA

83 -

FACULTY

2

STAFF

2

JOINT ADVANCED TECHNOLOGY PROGRAM

This is a collaborative programme between the Defence Research and Development Laboratory (DRDL), Hyderabad and the Indian Institute of Science.

At present investigating groups are drawn from the Departments of Aerospace, Mechanical Engineering and the School of Automation. The broad areas comprise of aerodynamics and combustion, struc-

tural mechanics, guidance and control and interdisciplinary areas such as structure-combustion and structure-control interaction. Many of the projects aim at generating fundamental results and others will create information not generally available. The long-term plans include the creation of scientific groups and expertise to foresee and handle problems of strategic importance in the national scene.



ESTD : 1911

LIBRARIAN

CFH TACCHELLA	19 - 24
K AMRITA RAO	25 - 40
GT KALE	40 - 50
BV RAGHAVENDRA RAO	51 - 68
TKS IYENGAR	69 -

DY. LIBRARIAN	3
ASST. LIBRARIAN	8
STAFF	42

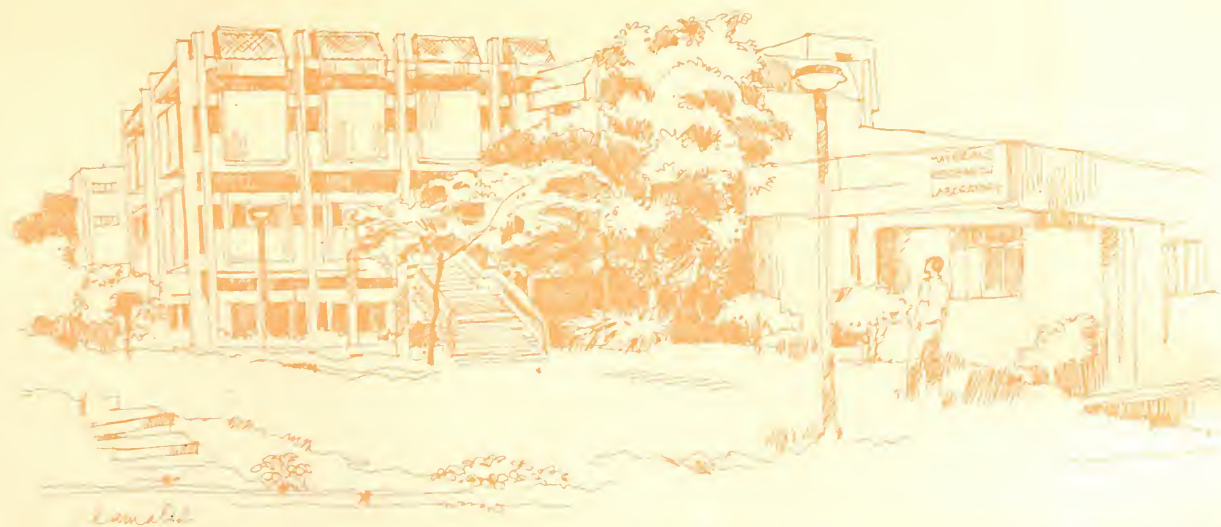


LIBRARY

With a collection of over 2,70,000 volumes of books, periodicals and reports, the Library located in the 5000 Sq. M. Golden Jubilee Memorial Building is one amongst the finest anywhere. It subscribes to over 2300 current periodicals and acquires regularly the latest technical reports of NASA, UKAEA, Indian, American and British Standards and Indian patents.

It offers reference, overnight loan, inter-library lending and documentation services and selective dissemination of information in special areas.

In addition to the staff and students of the Institute many Universities, R & D Centres, Scientific Laboratories and Industries are using this resource facility as visualised by the Founder.



MATERIALS RESEARCH LABORATORY

MATERIALS Research Laboratory has been organised as a focal point for interdisciplinary research activity at the Institute. It brings together the faculty and the students with Physics, Chemistry, Metallurgy, Electronics and other types of background to be able to do research in the general area of materials. The laboratory has sophisticated instrumental facilities for structural investigations. It has also facilities for novel methods of synthesis such as related to thin films and high temperature techniques. While the laboratory provides instrumental facilities such as electron microscopes, ESR and Raman spectrometers for investigators outside of MRL, it has several in-house research programmes related to electronic materials, solid state electronics, thin films, and synthetic and structural chemistry.

In the area of solid state electronics GaAs has been investigated in detail. Both n and p type layers have been grown with control on doping parameters. Schottkey barrier configurations have been investigated. Deep level studies with chromium doped semi insulating GaAs have been performed.

A number of interesting minerals, such as chloritoid, amphiboles etc. which are important to the understanding of geology of Karnataka, have been investigated using high resolution electron

microscopy. Extensive studies on oxides related to β -alumina have also been carried out to characterise the different phases and to investigate their structural stability under electron beam irradiation.

Synthesis of novel materials is one of the important objectives of the laboratory. Facilities for making high temperature and controlled ambient preparations have been set up. Novel procedures for sintering electronic grade alumina are under progress. Materials such as stabilised MnO, γ -Fe₂O₃ have been prepared. Facilities to grow single crystals of improved opto-electronic and ferro-electric materials such as LiNbO₃ have been set up. Research is under progress in the areas of rapidly quenched metals and metal oxides using roller quenching techniques. Novel low temperature preparative technique, which uses a solution deposition route, has been used to prepare chalcogenide films.

RF sputtering technique, particularly useful in the preparation of sputtered films using powdered samples, has been developed.

Investigations related to PTC materials based on BaTiO₃ have yielded significant results related to microstructure and temperature coefficients of resistivities.

ESTD : 1978

CHAIRMAN

CNR RAO 78-84

KJ RAO 84 -

FACULTY 6

STAFF 8

PUBLICATIONS 79-84 30



SOPHISTICATED INSTRUMENTS FACILITY

This has been set up as a National Facility to provide access to sophisticated and expensive instruments for the analytical and testing need of scientists all over the country and to promote the instrumentation culture.

At present the following equipment are available :

1. Bruker 270 MHz high resolution FTNMR spectrometer :

This instrument is equipped with a superconducting magnet and an on-line minicomputer. The spectrometer is equipped with probes for recording proton, carbon - 13 and deuterium spectra. In addition to routine analysis of samples of interest to organic chemistry, the instrument is used extensively by the scientific community for such diverse problems as i) analysis of organo-metallic complexes ii) biophysical problems such as protein and nucleic acid conformations in the solution state iii) transport across membranes and micell formation and iv) analysis of constituents of petroleum products.

Current interests are :

- i) development of two-dimensional NMR techniques and implementation ii) investigation in NMR of liquid crystals and molecules oriented in liquid crystals iii) development of a micro processor based computer system for increasing the throughput of the spectrometer iv) development of additional hardware/software facilities to the existing system.

2. JEOL's JEM 200 CX Electron Microscope :

This is a 200 KV transmission electron microscope with scanning attachment. The facility is currently used for high resolution electron microscope studies on oxides related to alumina and on silicate minerals from different parts of the states of Karnataka and Tamilnadu.

A Bruker MSL-300 FTNMR spectrometer for analysing problems of the solid state is under acquisition.

ESTD : 1982

CHAIRMAN

S RAMASESHAN 82 - 84

CNR RAO 84 -

FACULTY 2

STAFF 2

A Campus Vignette

The Hostel





TIFR — IISc MATHEMATICS PROGRAMME

Given the long and rich tradition of research in science and engineering at the Indian Institute of Science and the powerful background in pure mathematics at the Tata Institute of Fundamental Research, it was felt that a combination of the two would yield a strong centre for research in application of mathematics to problems in scientific domains.

Seminars, colloquia and short courses by eminent mathematicians from India and overseas enable young researchers' initiation into new fields. Lecture notes by these visiting professors are published in a series. One such programme was the winter

school on the numerical simulation in engineering and applied mathematics conjointly with the Indo-French scientific collaboration scheme.

The main directions of research are Numerical Analysis - Finite element methods for approximating solutions of partial differential equations, Partial Differential Equations — Pseudo-differential operators, nonlinear equations, stochastic processes and control theory.

Facilities :

PRIME 450 Computer with several terminals including one Tektronix Graphic Display.

ESTD : 1975

A Campus Vignette

Director's Bungalow



GENETIC ENGINEERING

The Genetic Engineering group established in the Institute at the initiative of the DST has taken up several specific research projects in this major thrust area, a few of which are mentioned below :

Gene Expression in Rice Embryos :

The DNA fragments containing histone genes H2A, H2B and H4 were cloned in plasmid pBR - 322 at the Bam H1 site in the *tet* gene. The cloned genes were amplified and the restriction map and the partial DNA sequences were determined. The regulatory sequences for the transcription of H2A gene were found from the DNA sequence.

Organization & Expression of Cytochrome P - 450 genes in rat liver :

The Cytochrome P - 450 group of proteins in liver play an important role in drug detoxication, carcinogen activation and toxic metabolite production. A cDNA library of the inducible, rat - liver cytochrome P - 450 mRNAs has been prepared in the plasmid pBR - 322. Of the 12 identified cDNA clones of P - 450, one has been characterized in detail. The restriction mapping and partial sequencing of this insert is being carried out.

Gene Expression in the Silk Worm, *Bombyx Mori* :

A genomic library of the silk worm has been established in Charon 4 phage using a partial Eco R1 digest of the silk gland DNA. The presence of fibroin

gene in the genomic library has also been identified using labelled fibroin RNA probes. These clones are being analysed for molecular interactions involved in the control of expression.

Studies on tRNA :

Base modifications of constituent tRNA bases in microorganisms have been investigated in relation to growth conditions. More recently, the tRNAs from plants have also been studied in greater detail. The phenyl alanine - specific tRNA from 'Ragi' has been isolated in a pure state. Using this purified tRNA as a probe, the gene for phe - tRNA from 'Ragi' has been cloned in Charon 4 phage.

Rinderpest Virus - specific Gene Expression :

In view of the persistence of RV in cattle and its connection with the occurrence of neurological disorders, it is proposed to examine RV - specific gene expression in the course of acute and persistent infections. Establishment of persistent infection by RV in Vero cells has been successful and the persistently infected cell line (Pi - 2) has been passaged more than 60 times. Synthesis of virus particles as well as virus - specific proteins by this cell line has been examined. Comparison of virus specific protein synthesis in acutely infected cells with the Pi - 2 cell line has revealed striking differences.

ESTD : 1982

MEMORIAL LECTURES

JN TATA

HJ BHABHA

Atomic Energy in Indian Economy 1962

S BHAGAVANTAM

The Widening Spiral of Science and Technology 1964

VIKRAM A SARABHAI

Science and World Affairs with special reference to Developing Countries 1966

PB GAJENDRA GADKAR

The Imperatives of Indian Federation 1968

MGK MENON

The Social Conscience of Science 1970

MALCOLM S ADISESHIAH

Growth: Its Imperatives and Limits 1972

HN SETHNA

Energy: Systems, Development & Policy 1974

RAJA RAMANNA

Safety of Nuclear Installations 1976

DS KOTHARI

Science and Self-Knowledge 1979

MS SWAMINATHAN

Indian Agriculture at the crossroads 1981

M CT M CHIDAMBARAM CHETTIYAR

KL RAO

Modern Design of Dams 1961

VM GHATGE

The Growth of Aeronautical Industry in India 1965

GS KASBEKAR

Development of Chemical Plants and Chemical Plant Fabrication in India 1968

AP KANVINDE

Role of Architectural Profession in the Socialistic Pattern of Society 1971

MM SURI

Scientific Education and Unemployment in India 1973

A RAMACHANDRAN

Solar Energy—Challenges and Perspectives in India 1977

VITHAL N CHANDAVARKAR

AD SHROFF

Finance for our Industries 1963

HVR IYENGAR

The Impact of Government on Business Management 1964

PL TANDON

The New Managerial Society 1967

BR SHENOY

National Savings and Industrial Finance—Indian Experience 1969

BHARAT RAM

Role of Science and Technology in Economic Development 1973

S VARADARAJAN

Scientists in the Management of Business 1978

PR BRAHMANANDA

Productivity in the Indian Economy—An Exploratory Exercise 1982

GOLDEN JUBILEE

VIKRAM A SARABHAI

The Sun and Interplanetary Space 1966

K VENKATARAMAN

New Dyes for Old and New Fibres 1968

S SWAYAMBU

Modern Trends in Electric Drive System for Industry 1971

GP KANE

1974—A Year of Crisis or Opportunity? 1975

S KRISHNASWAMY

Energy Prospects for India in the International Environment 1977

A SREENIVASAN

Some Growing Points in Food Research 1979

S RAMAMRITHAM

Thirty Years of Air Safety Experience in Indian Civil Aviation 1981

CV RAMAN

S RAMASESHAN

CV Raman 1978

SUKH DEV

Research and Development in Chemical Industry 1980

CNR RAO

Man, Minerals and Microscopes 1983

More Campus Vignettes



Centre for Theoretical Studies



Industrial Management

MEDALS INSTITUTED

BEST B.E. STUDENT

- ALUMNI : *Electrical Communication Engineering*
HAY : *Electrical Engineering*
KK MALIK : *Metallurgy*
HR BAPU SEETHARAM : *Best B.E. Degree Project Work in Electrical Communication Engineering*

BEST M.E. STUDENT

- PROF SVC AIYA : *Electrical Communication Engineering*
NR KHAMBHATI MEMORIAL : *Electrical Engineering*
TAG CORPORATION : *High Voltage Engineering*
Mrs SABITA CHAUDHURI MEMORIAL : *Aerospace Engineering*
PROF NR KULLOOR MEMORIAL : *Chemical Engineering*
PROF NS GOVINDA RAO : *Civil Engineering*

BEST THESIS

- MARTIN FORSTER : *Division of Physics and Mathematical Sciences*
ALUMNI : *Division of Electrical Sciences*
PS NARAYANA : *Division of Mechanical Sciences*
M SREENIVASAIA GUHA : *Organic Chemistry*
PROF BH IYER SUDBOROUGH : *Inorganic & Physical Chemistry, Organic Chemistry*
DR JC GHOSH : *Inorganic & Physical Chemistry, Solid State & Structural Chemistry*
PROF GIRI MEMORIAL : *Among the members of the Bio-Chemical Society*
PROF NR KULLOOR MEMORIAL : *Chemical Engineering*
Mrs SABITA CHAUDHURI MEMORIAL : *Aerospace Engineering*
Mrs CV HANUMANTHA RAO : *'Towards Alleviation of Human Suffering' Faculty of Science*
SIR VITHAL N CHANDAVARKAR MEMORIAL : *'On progress in industry or Human Relations' Faculty of Engineering*

Administration

REGISTRAR

RP BAHADUR	39 - 44
AG PAI	44 - 64
SS PRABHU	64 - 75
T NANJUNDA RAO	76 -
OFFICERS	20
STAFF	225

The Court and the Council of the Institute lay down the policies and oversee its working. The Director — the Chief Executive, is assisted by an administrative group in addition to the academic bodies, the senate and the faculty, in the translation of the policies. General Administration, Personnel, Public Relations, Purchase, Stores and Security functions are handled by unit heads, working under the Registrar.

Finance and Accounts are under the purview of the Finance Officer. The Registrar and the Finance Officer report to the Director.

The Registrar, as the Secretary to the Court, Council and the Senate provides yet another direct link between policy making and its implementation in an academic and science management environment.

SPONSORED RESEARCH

Basic and applied research in a number of disciplines have been sponsored by several public and private research, development and industrial organisations, both national and international. The projects have enabled pursuit of studies in a number of new and emerging areas of science and technology, in addition to providing the much needed funding for updating of the equipment and facilities.

Over 160 of the Institute's faculty are engaged in approximately 220 projects. 80 to 90 new projects are undertaken every year. The projects account for 250 research and 125 supporting staff positions. The annual cash flow is of the order of Rs. 250 lakhs and the value of new projects initiated is of the order of Rs. 200 lakhs. A listing of the major projects (value over Rs. 20 lakhs) undertaken reflects the spectrum of research interests.

Major Projects

Hypersonic wind tunnel — 8" dia.
R Narasimha AE
ARDB 1972 Rs. 42 lakhs

Platinum Jubilee

Development of hybrid propulsion system
VK Jain AE
ARDB 1977 Rs. 31 lakhs

Bio-conversion of cellulosic wastes into protein rich food and industrially useful chemicals
PJ Vithayathil BC
DST 1979 Rs. 21 lakhs

Development of differentiation of chick oviduct and rat testis in role of vitamin A
G Padmanabhan BC
DST 1981 Rs. 38 lakhs

Sound transmission in coastal seas (STICS)
PS Naidu ECE
Elec. Commn. 1977 Rs. 39 lakhs

Fibre Diffraction and X-ray crystallographic studies on nucleic acid proteins and their interaction
V Sasishekaran MBU
DST 1983 Rs. 72 lakhs

Noise characteristics of marine propellers
VH Arakeri ME
Elec. Commn. 1979 Rs. 22 lakhs

Studies in DNA Crystallography
MA Viswamitra PHY
DST 1983 Rs. 62 lakhs

Electron state of molecules, solids and surfaces
CNR Rao SSCU
DST 1976 Rs. 38 lakhs

National Thermophysical Properties Programme (NTPP)
CNR Rao SSCU
DST 1978 Rs. 22 lakhs

Investigation in surface science by electron energy loss spectroscopy and other cognate techniques
CNR Rao SSCU
DST 1981 Rs. 41 lakhs

Sponsoring agencies

ARDB	Aeronautics Research & Development Board
CBIP	Central Board of Irrigation & Power

CSIR	Council of Scientific & Industrial Research
DRDO	Defence Research & Development Organisation
DAE	Department of Atomic Energy
DST	Department of Science & Technology
Elec. Commn.	Electronics Commission
FF	Ford Foundation
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
INSA	Indian National Science Academy
ISRO	Indian Space Research Organisation
NSF	National Science Foundation
PL-480	U S Public Law - 480
TERI	Tata Energy Research Institute
UGC	University Grants Commission
WHO	World Health Organisation
Others	CIPLA, Dhiraj Enterprises, Family Planning Foundation, Garg Associates, Hindustan Levers, Kale Educational Trust, UNICHEM.



A Campus Vignette

In the Nursery

PROJECT ENGINEER ESTATE OFFICER

C CHIDAMBARAM

ENGINEERS	14
STAFF	197

The sylvan campus spread over 170 hectares is located in the northern part of the Garden City of Bangalore known for its salubrious climate through the year. With the growth in activities over the years, the number of buildings, mostly in granite, now stand at 250, with a plinth area of 180,000 sq m in a dense area of 100 hectares. The Estate Office with its corps of engineers, technicians, gardeners and supporting staff looks after the construction of roads, buildings, power, water supply and sanitation systems in addition to the maintenance functions.

Campus trees and gardens lend a unique character to the Estate. There are over 7000 trees, belonging to 121 species. Many of the trees are exotic and rare and have been brought from various parts of the world. The nursery supports the maintenance and development of the trees and gardens on campus.

A master plan for future campus development — buildings and trees, has been drawn up. A Platinum Jubilee garden spread over 6 hectares is being developed.

The present Nursery started as a small collection of plants kept on the verandah of the Registrar's bungalow in 1945-46. The plants had been put there by B S Nirody, the well-known horticulturist. Later, the area between the present Guest House and the Registrar's bungalow as far down as the swimming pool was chosen for maintaining plants and trees to be used for the avenues and departmental gardens of the Institute, and Nirody was put in charge of it.

There followed a period of very fruitful activity when the Nursery quickly filled up with plants brought in from all over the country and a good many from exotic lands.

The Nursery has fulfilled its expectations of supplying the plant material for landscaping the grounds. It is also a constant source of potted plants for the decoration of halls and passages and shamianas when important functions are held. Besides, it is a place where research students can raise the material they need for their investigations, there being a good staff of malis.

There is now also a small library where one can identify plants, read about gardening

Platinum Jubilee

techniques and look up the cultural requirements of plants, local and unfamiliar.

The women of the campus have often gathered in the nursery for understanding methods of plant propagation.

Nirody collaborated with biochemistry students to find a patchouli plant with a higher yield of oil and was awarded a medal by the Essential Oils Committee. Much hybridizing of gerberas was done and many new colours and double varieties were introduced.

A rich collection of begonias has always been the pride of the Nursery and this is constantly being added to. Two of the malis have even added several new varieties of trailing and cane begonias by selection from seedlings — a delicate task.

The following is a list of the rare trees to be found on the IISc grounds:

- 1 Cassia moschata which in March gets covered with pendulous orange flower clusters. From South America.
- 2 Peltophorum vogelianum with flowers of quite a different yellow from those of the common P. ferrugineum. A Brazilian tree.



- 3 Petrea arborea, a tree form of the creeper Petrea volubilis. From Tropical America.
- 4 Lonchocarpus sp. an avenue of which has been planted along the Library wall. Also from Tropical America.
- 5 Bolusanthus speciosus or Rhodesian Wisteria tree of which there are three specimens on the campus.
- 6 Bauhinea blakeana, a Hong-Kong tree.
- 7 Ceasalpineia pausijuga.

8 *Tabebuia heptaphylla*. From South America.

Mention must also be made of the white bougainvillea which Homi Bhabha brought back from Brazil at Nirody's request. It was a rarity here in its day, and no doubt, helped in the hybridizing of the great profusion of bougainvilleas now to be found.

Altogether, the Nursery has long done the work of, and earned the more relevant name of *Plant Introduction Unit*.

CAMPUS TREES

Acacia arabica babul
Acacia concinna (Soapnut Acacia)
Acacia farnesiana (Sweet Acacia)
Acacia cultriformis
Adenanthera pavonina
Aleurites montana
Albizia sps.
Anda gomesii
Araucaria cookii
Araucaria bidwillii
Artocarpus integrifolia
Anthocephalus cadamba
Bassia longifolia
Barringtonia racemosa
Bauhinia varieties (Mandāra)
Bombax malabaricum
Brassia actinophylla (Umbrella Tree)
Butea frondosa
Brounia grandiceps
Callistemon lanceolatus (Bottle Brush)
Caesalpinia coriaria
Calophyllum inophyllum
Cananga odorata
Cassia fistula (Indian Laburnum)
Cassia siamea
Cassia grandis
Cassia marginata
Cassia renigera
Cassia javanica
Cassia spectabilis
Cassia nodosa
Cassia moschata
Casterospermum australe

Casuarina equisetifolia
Cedrela odorata
Cedrela toona
Citharexylon subseratum
Cochlospermum gossypium
(Yellowsilk Cotton Tree)
Cordia myxa
Cordia alba
Cordia sebatena
Colvillea racemosa (Sunset Tree)
Clusia rosea
Courpita guianensis (Nāgalinga)
Crescentia cujata
Cupressus sps.
Dalbergia sissoo
Dellenia indica
Dolichandrone platycalyx
Duabanga sonneratiodes
Eriodendron anfractuosum
Erythrina sps.
Eucalyptus sps.
Eugenia jambolana
Eugenia jambos (Rose Apple)
Eugenia malaccensis (Malaya Apple)
Ficus benjamina (Java Fig)
Ficus bengalensis
Ficus mysorensis
Ficus religiosa (Peepul)
Ficus roxburghii
Ficus elastica
Ficus variegata
Filicium decipiens (Fern Tree)
Gliricidia maculata
Gauzuma tomentosa
Grevillea robusta (Silver Oak)
Guaicum officinale
Heritiera littoralis (Looking Glass Tree)
Ingadulcis
Ixora parviflora
Jacaranda mimossefolia
Kigelia pinnata
Lagerstroemia flosreginae (Pride Of India)
Lanchocarpus roseus
Mangifera india (Mango)
Melia azadirachta (Neem)
Melia azedarach (Persian Lilac)
Magnolia grandiflora
Michelia champaka

Millingtonia hortensis
Mimusops elengi
Moringa pterygosperma
Millettia ovalifolia (Drumstick)
Melalueca leucadendron
Muntingia calabura (Singapore Cherry)
Parkia biglandulosa
Parkia roxburghii
Peltophorum ferrugineum
(Yellow Gulmohur)
Peltophorum vogelianum
Pithecolobium saman (Rain Tree)
Plumeria vars
Poinciana regia or *Delonix regia*
(Gulmohur)
Polyalthia longifolia
Polyalthia pendula
Pongamia glabra
Podocarpus chinensis
P. moorii
Prosopis juliflora
Pterospermum acerifolium
(Kanaka Champa)
Putrangiva roxburghii
Santalum album (Sandal)
Sapindus emarginatus
Saraca indica (Ashoka)
Saraca cauliflora
Schinus molle
Spathodea campanulata
Sterculia acerifolia
Sterculia alata
Sterculia colorata
Swietenia mahagoni
Swietenia macrophylla
Salix babylonica (Weeping Willow)
Solanum macranthum
Tippuvana tippu
Tabebuia spectabilis
Tabebuia rosea
Tabebuia heptaphylla
Tabebuia guaycan (Avalandii)
Tabebuia argentea
Tamarindus indica
Tectona grandis (Teak)
Terminalia arjuna
Terminalia catappa (Indian Almond)
Thespesia populnea (Indian Tulip Tree)

Over and above, we have a number of flowering shrubs and conservatory plants.

BIRDS SIGHTED ON CAMPUS

Little Egret *Egretta garzetta*
 Cattle Egret *Bubulcus ibis*
 Pond Heron *Ardeola grayii*
 White Scavenger Vulture *Neophron percnopterus*
 Pariah Kite *Milvus migrans*
 Brahminy Kite *Haliastur indus*
 Pale Harrier *Circus macrourus*
 Short-toed Eagle *Circaetus gallicus*
 Shikra *Accipiter badius*
 White-Breasted Waterhen *Amaurornis phoenicurus*
 Red-wattled Lapwing *Vanellus indicus*
 Yellow-wattled Lapwing *Vanellus malabaricus*
 Green Sandpiper *Tringa ochropus*
 Blue Rock Pigeon *Columba livia*
 Spotted Dove *Streptopelia chinensis*
 Rose-ringed Parakeet *Psittacula krameri*
 Koel *Eudynamis scolopacea*
 Coucal *Centropus sinensis*
 Plaintive cuckoo *Cacomantis passerinus*
 Spotted Owlet *Athene brama*
 Barn Owl *Tyto alba*
 Great Horned Owl *Bubo bubo*
 House Swift *Apus affinis*
 White-breasted Kingfisher *Halcyon smyrnensis*
 Pied Kingfisher *Ceryle rudis*
 Small Blue Kingfisher *Alcedo atthis*
 Small Green Bee-eater *Merops orientalis*
 Roller *Coracias benghalensis*
 Hoopoe *Upupa epops*
 Copper-smith *Megalaima haemacephala*
 Small Green Barbet *Megalaima viridis*
 Indian Pitta *Pitta brachyura*
 Ashy-crowned Finch Hark *Eremopterix grisea*

Red-winged Bush Lark *Mirafra erythroptera*
 Common Swallow *Hirundo rustica*
 Red-rumped Swallow *Hirundo daurica*
 Large Pied Wagtail *Motacilla maderaspatensis*
 Yellow Wagtail *Motacilla flava*
 Small Minivet *Pericrocotus cinnamomeus*
 Red-vented Bulbul *Pycnonotus cafer*
 Bay-backed Shrike *Lanius vittatus*
 Brown Shrike *Lanius cristatus*
 Brown Flycatcher *Alseonax latirostris*
 Red-breasted Flycatcher *Ficedula parva*
 Magpie Robin *Copsychus malabaricus*
 Pied Bush-chat *Saxicola caprata*
 Indian Robin *Saxicoloides fulicata*
 Tailorbird *Orthotomus sutorius*
 Streaked Fantail warbler *Cisticola juncidis*
 Ashy Wren-warbler *Prinia socialis*
 Indian Wren-warbler *Prinia subflava*
 Blyth's Reed warbler *Acrocephalus dumetorum*
 Jungle Babbler *Turdoides striatus*
 Grey Tit *Parus major*
 Tickell's Flowerpecker *Dicaeum erythrorhynchos*
 Purple Sunbird *Nectarinia asiatica*
 Purple-rumped Sunbird *Nectarina zeylonica*
 White-eye *Zosterops palpebrosa*
 Spotted Munia *Lonchura punctulata*
 Red Munia *Estrilda amandava*
 Black-headed Munia *Lonchura malacca*
 House Sparrow *Passer domesticus*
 Brahminy Myna *Sturnus pagodarum*
 Jungle Myna *Acridotheres fuscus*
 Common Myna *Acridotheres tristis*
 Golden Oriole *Oriolus oriolus*
 House Crow *Corvus splendens*
 Jungle Crow *Corvus macrorhynchos*
 Black Drongo *Dicrurus adsimilis*



ALUMNI ASSOCIATION

ESTD : 1976

PRESIDENT

CR RAO

SECRETARY

NARAIN B MAHISHI

A bi-annual 'Open Day' at the Institute on March 3, the Founder's day and organisation of the 'CV Raman Memorial Lecture', in alternate years, delivered by eminent alumni on important topics of national interest and the distinguished alumnus award are the notable highlights. The Association has local chapters at many cities in the country to promote interactions among the alumni for furthering the cause of Science and Technology.

Distinguished Alumnus Awardees

- '77 — RAMACHANDRAN GN
Professor, Mathematical Biology, IISc
- '78 — SUKH DEV
Director, Maltichem Research Centre, Baroda
- '79 — SUBRAMANIAN CR
Chairman & Managing Director, Bharat Electronics Ltd., Bangalore
- '80 — HARISH CHANDRA
Professor, Mathematics, Institute of Advanced Study, Princeton
- '81 — ANANTHARAMAN TR
Director, Institute of Technology, Banaras Hindu Univ.
- '82 — SATISHCHANDRAN TR
Chief Secretary
Government of Karnataka, Bangalore

IISc 1909-1984

STUDENT COUNCIL

CHAIRMAN

S SHYAMA SUNDAR

SECRETARY

YELLOJI RAO

Provides feed back communication link on academic, research and welfare aspects of student life on campus through meetings with the Director. The Chairman and Secretary are the elected representatives; the six members on the steering committee are elected by the student representatives of the various programmes. 'News-letters', 'Drag' — a monthly magazine, a Technical Hobby Club and a HAM Workshop are some of the highlights of its activities.

STUDENT HOSTEL

WARDEN

A KUMAR

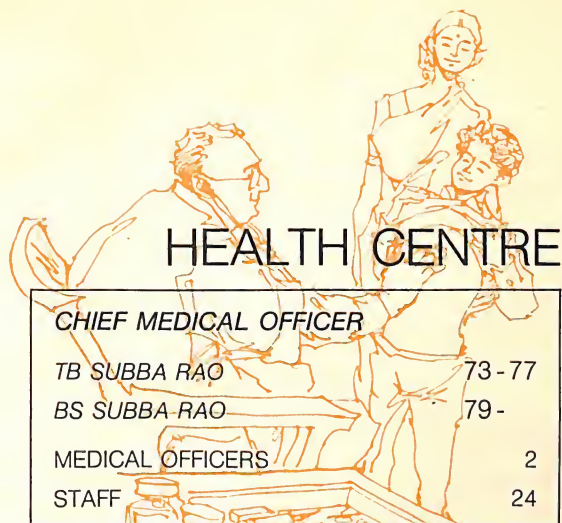
OFFICER

1

STAFF

106

Residential accommodation and boarding facilities on campus has kept pace with the growth of the Institute. There are now 14 buildings housing nearly 1300 students. The four buildings in which the hostel was started, having accommodation for 80 men and 20 women students are being used even to this day. The kitchens and dining halls are well equipped, modern and hygienic. Further augmentation of the facilities to meet the increasing demand is planned. The facility is one of the best of its kind in the country.



HEALTH CENTRE

CHIEF MEDICAL OFFICER

TB SUBBA RAO 73-77

BS SUBBA RAO 79-

MEDICAL OFFICERS 2

STAFF 24

Health Centre at the Institute had its origin over four decades ago through the part time services of a physician. Subsequently, the Institute established its own health care facility called the First Aid Centre and later the Dispensary. Health Centre now covers faculty, staff and their dependants as well as students.

An out-patient clinic and limited in-patient service are provided. It has three full time doctors in addition to the part time services of the dentist, ophthalmologist and a radiologist. It draws upon expertise from a larger pool of medical and surgical specialists for consultation. Apart from emergency, social, preventive and curative medical services, immunisation programmes, blood donation camps and cancer detection camps are organised.

Special investigations in radiology such as Intravenous pyelograms and myelograms, family welfare clinics, paediatric advice, orthopaedic care and cardiac care for patients not requiring monitoring are among the services offered.

Clinical studies carried out in association with the Institute faculty to understand the problems of nasobronchial allergy prevalent in Bangalore has led to a diagnostic clinic. Aminoacid study has aided in early detection of mental retardation in children. Another topic concerns thyroid ailments.

It has a diagnostic laboratory, dental and eye clinics and an X-ray facility. ENT and psychiatric care are envisaged.

Platinum Jubilee



RECREATIONAL

Gymkhana

ESTD: 1924

PRESIDENT - MS NAIDU

CHAIRMAN - S RAJA

SECRETARY - B PRATAP

Recreational facilities in the Gymkhana provide the right kind of atmosphere for fellowship among the students and staff drawn from different parts of the country and indeed nations. Several of the co-curricular and extra-curricular activities provide intellectual stimulation. Linkages with the community of scholars in and around Bangalore as well as outside are nurtured through "Vibrations", a week long student festival and tournaments in Cricket, Volley-ball, Table Tennis, Shuttle Badminton conducted on campus.

Staff Club

ESTD: 1957

PRESIDENT - TR KASTURI

SECRETARY - N NAGARAJA RAO

Offers recreational facilities and organises music, dance, theatre, art and sports activities on campus.

Tata Memorial Club

ESTD: 1926

PRESIDENT - B CASPER

SECRETARY - S SOMASUNDARA

Indoor games, reading rooms and library facilities on the one hand and active participation in sports and cultural activities on the other are the highlights.

ASSOCIATIONS

To preserve, protect and promote the interests, rights, privileges, recognition, advancement, as well as the professional and social status of members.

Employees'

ESTD: 1978

PRESIDENT - CN KRISHNA MURTHY

SECRETARY - G RAMU

Endeavours to create a healthy environment of cordiality and understanding between the supporting staff and the administration and promote an ideal employer-employee partnership.

Faculty

ESTD: 1980

PRESIDENT - VK JAIN SECRETARY - AK LAHIRI

It primarily aims to promote effective faculty participation in the formulation and implementation of policies appropriate to a premier national institution, participate in the development of teaching methods and improved teaching standards, work for the uplift and welfare of society as a whole through the development of science in all its aspects.

Officers'

ESTD: 1982

PRESIDENT - NARAIN B MAHISHI

Promotion of administrative efficiency, participation in the formulation and implementation of policies in keeping with the objectives of the Institute.

SC/ST Welfare

ESTD: 1979

PRESIDENT - MPAPANNA SECRETARY - GNAGAIH

Promotes and encourages fellowship and the spirit of mutual cooperation and understanding among its members.

Pensioners'

ESTD: 1981

PRESIDENT - VR GANGADHARIAH

SECRETARY - TK SHIVASUBRAMANIAM

'Out of service is not out of mind'. Activities are related to fellowship among compatriots, serving and served, as well as nurturing the intangible yet enduring cords with the Institute.

PLATINUM JUBILEE SEMINARS

The Institute hosts a variety of seminars, symposia and meetings of professional societies both national and international. During the Platinum Jubilee year, there has been a number of such gatherings which are given below :

SEMINARS AND SYMPOSIA

Physics of Semiconductors *Physics*
 Power System Reliability *UNESCO-Regional Electrical Engineering*
 Advances in Metal Processing *Metallurgy*
 Recent trends in Organic Chemistry *Organic Chemistry*
 Communications *Electrical Communication Engineering*
 Microsomal Redox System *Biochemistry*
 Theoretical Physics *International Centre for Theoretical Studies*
 Biomolecular Structure and Interactions *International Molecular Biophysics Unit*
 Thin Film Science and Technology *Instrumentation & Services Unit*
 Developments in Moulding and Core making
Mechanical Engineering

CONFERENCES AND MEETINGS

Low Temperature Physics *Indo-Soviet*
 Indian Optical Society
 Crystallography
 Magnetic Resonance in Biological Systems *International*
 Astronomical Society of India *Physics*
 Non-destructive Evaluation
 Ferroelectrics and Dielectrics *Aerospace Engineering*
 Extra High Voltage Techniques *High Voltage Engineering*
 Computers, Systems and Signal Processing *IEEE International Electrical Sciences*
 Machines and Mechanisms *Mechanical Engineering*

WORKSHOPS

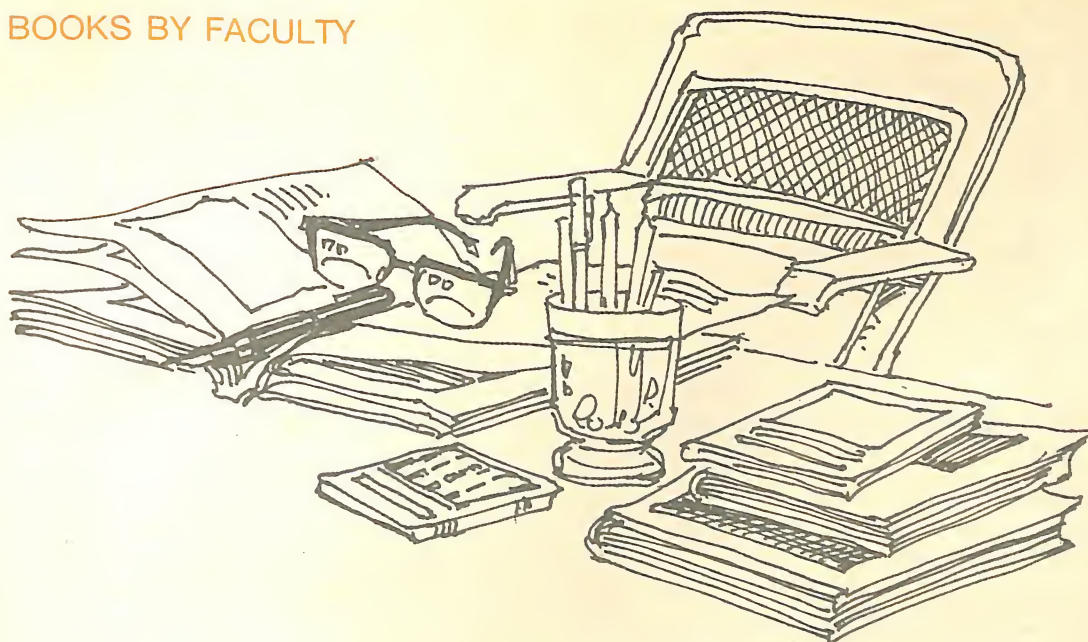
Curriculum Development—Engineering
Centre for Continuing Education

Metallic Glasses *Metallurgy*
 Climate and Oceanography *Indo-US Centre for Atmospheric Sciences & Aerospace Engineering*
 Systems loss Minimisation *Electrical Engineering*
 Preliminary Orbit determination *Aerospace Engineering*
 Update on Inorganic & Physical Chemistry *Inorganic & Physical Chemistry*

COURSES AND SUMMER SCHOOLS

Laboratory Techniques in Genetic Engineering *Microbiology and Cell Biology*
 Microprocessors *Aerospace Engineering*
 Microprocessors—Design and Applications
 Instrumentation *Regional Instrumentation Centre Programme*
 High Vacuum Techniques
 Metrology *Instrumentation and Services Unit*
 Computer based Numerical Techniques in Engineering
Chemical Engineering
 Computers and Linguistics *Foreign Languages Section*
 Computer Systems and Signal Processing
 Programming Methodology
 Introduction to Systems Software
 TIFR/NCSDT *School of Automation*
 Optical Waveguides and Guided Wave Devices for
 Communications *Electrical Communication Engineering*
 Theoretical High Energy Physics *Centre for Theoretical Studies*
 Environmental Impact of Mining *Metallurgy*

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June '80.


*Baya or The Common
weaver-bird ♂.*

The Indian Institute of Science, Bangalore 560 012, India.

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*The woods are lovely, dark and deep,
But I have promises to keep,
And miles to go before I sleep,
And miles to go before I sleep.*

— ROBERT FROST

1909-84

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PLATINUM JUBILEE

